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PAVEMENT EVALUATION AND REHABILITATION MANUAL

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PAVEMENT EVALUATION AND REHABILITATION MANUAL

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SCOPE

This manual provides uniform procedures for determining the condition of pavement and shoulders, and for evaluating alternate rehabilitation treatments. Standard forms have been developed for collecting project information, for collecting and analyzing pavement and shoulder distress data, and for reporting pavement condition. A cost analysis procedure is given to identify the most cost effective rehabilitation treatment.

INTRODUCTION

The success of a pavement rehabilitation treatment is very dependent upon choosing the best treatment for the intended repair. In order to choose the best treatment, it is necessary to analyze alternate treatments. A proper analysis of alternatives requires a thorough evaluation of the existing pavement, shoulders, foundation and the drainage.

The appropriate time to perform a pavement evaluation is at the time when a project is being initiated. The advantage of having the information at this time is as follows:

1. Alternate rehabilitation treatments can be evaluated to analyze cost versus length of expected service.

2. Adequate funds can be programmed for the project.

Candidate projects for rehabilitation are usually identified either by the Highway Maintenance Resident Engineer or by the network condition survey rating. The actual condition of the pavements may range from pavements that are in very poor condition and require significant work to pavements that are in good condition and need only minor rehabilitation. An example of minor rehabilitation would be replacing joint seals in a portland cement concrete pavement.

These condition evaluation and rehabilitation procedures should achieve uniform decision making by designers in the selection of appropriate and cost effective pavement rehabilitation treatments.

GENERAL PROCEDURE

The general procedure for evaluating the condition of pavements and then analyzing alternate rehabilitation treatments include the following steps:

1. Acquire project information from records which provides history, features and related data on the pavement.

2. Perform a field distress survey on the pavement and shoulders.

3. Obtain information from the Highway Maintenance Resident Engineer on the pavement and shoulder performance.

4. Perform an investigation of the pavement, shoulders, foundation and drainage as necessary.

5. Prepare a report on the condition of the pavement and shoulders.

6. Determine appropriate rehabilitation treatment alternatives.

7. Perform a cost analysis on each alternate treatment.

8. Recommend a treatment.

PROJECT INFORMATION

The project information shall be collected using a standard format developed for this pavement evaluation procedure. This information will identify the proposed project, provide history of the pavement, list roadway features, and provide related pavement data. The information should be available from records in the Region Office. The information shall be collected before making the field survey. The information should be checked during the field survey. The form for collecting project information is in Figure 1.

PAVEMENT AND SHOULDER CONDITION SURVEY

The evaluation procedure shall consist of making a field survey of the proposed project and collecting data on the severity and extent of major forms of distress that appear in the pavement and shoulders.

The field survey should be completed by a team of two people--one person for driving and another for taking data. Both people can collect data from the pavement and shoulder surfaces at the detail survey sections.

The field survey shall be performed when the entire pavement and shoulder surfaces are visible. If the survey is performed when frost is in the ground, this condition should be noted since the frost can magnify the distress.

The location of the information collected from the pavement in the field survey shall be identified by the reference marker system to the closest 0.05 mile.

Distress Data Collection

The data shall be collected using a standard format developed for this pavement evaluation procedure. This format provides assurance that all components of the roadway relating to the pavement and shoulders are evaluated and that the distress is described in standard terminology.

PAVEMENT EVALUATION REPORT
NEW YORK STATE DEPARTMENT OF TRANSPORTATION

PROJECT INFORMATION

General

Region: _____ County: _____ Route No: _____ PIN _____

Project Identification: _____

_____

Begin MM _____ End MM _____ Total Length _____

Original Contract Date(s): _____

Latest Pavement Rehabilitation Date(s): _____

Roadway Features

Roadway: Divided _____ Non-Divided _____

Pavement:
Lanes: No. _____ Widths(s) _____

Type: Reinforced PCC _____ Non-Reinforced PCC _____
AC _____ AC over PCC _____

Thickness (nominal): Total _____ (AC _____ PCC _____)

Reinforced and Non-Reinforced PCC Pavements only:
Slab Length _____
Load Transfer Type: Dowels _____ 2 Component _____
Transverse Joints: Contraction _____ Expansion _____

Subbase:
Type: _____ Thickness (nominal): _____

Shoulders:
Type: AC _____ PCC _____ Gravel _____
AC or Surface Treatment/Stabilized Gravel _____
Width: Both _____ Driving Lane _____ Passing Lane _____

Related Pavement Date

Traffic AADT (Range) _____ Date _____ % Trucks _____
Sufficiency Rating (Range) _____ Date _____
PRI (Range) _____ Date _____
Friction (Range) _____ Date _____

Prepared By _____ Date _____

Figure 1

Procedures for collecting data on the severity and extent of distress on the following types of pavement are in the Appendices.

Appendix I - General Instructions
Appendix II - Rigid
Appendix III - Flexible
Appendix IV - Flexible/Rigid Base
Appendix V - Shoulders

Initially, the surveyors shall ride the entire proposed project at or near the posted speed limit to obtain an overview of the pavement condition. At this speed, some of the major forms of pavement distress and foundation problems which affect ride are apparent and shall be recorded as to type of distress and location.

After the ride-through at posted speed, the surveyors shall ride the entire proposed project on the shoulder, if possible, at a slow speed (5-10 mph) to observe all forms of distress in the pavement and shoulders. A determination shall be made on whether the distress is relatively uniform in severity and extent along the full length of the proposed project or if the distress is localized.

The next step will be to collect detail condition data for pavement and shoulders at the first one-tenth mile section in each one-half mile interval of the proposed project. The location of the one-tenth mile section shall be identified by the reference markers. If all or part of the one-tenth mile section falls on a bridge deck or approach slab, the one-tenth mile section shall be moved ahead in the one-half mile interval until all the one-tenth mile section is located on the pavement. If all or part of the one-tenth mile section falls at an at-grade intersection of two or more pavements, data shall be collected only if the pavement being evaluated is the through or primary pavement, otherwise the one-tenth mile section shall be moved ahead until all the one-tenth mile section is outside the intersection.

Under normal circumstances, the pavement condition data shall be collected as follows:

Roadway Type	Area Surveyed
Multi-lane, divided	Driving lane and right shoulder, both directions
Multi-lane, undivided	Driving lane and right shoulder, one direction
Two-lane, two-way	One lane and adjacent shoulder
Ramps and one lane roadways	Pavement and right shoulder

If the lanes are not uniform in condition across the roadway, data shall be collected from an additional lane(s) to represent the pavement.

Examples would be an asphalt concrete truck climbing lane adjacent to a portland cement concrete pavement and a four lane divided roadway which has slab faulting in only the driving lanes.

Following the collection of distress data, the severity and extent shall be determined for each distress type indicated on the form. If some distress types do not occur, the form shall indicate that none exists. The extent of most types of distress will be described as a percentage where as some types of distress will be described merely in terms of number or its presence in the section. Forms for distress data collection for the various pavement types and shoulders are in Figures 2, 3, and 4.

Highway Maintenance Input

The Resident Engineer shall be consulted to obtain information concerning seasonal affects which may not be apparent at the time of the pavement survey. The concerns should include the level of maintenance required on the pavement and shoulders; locations identified by reference markers on drainage problems, frost heaves, settlements or other foundation problems. The information from the consultation shall be documented and it shall become part of the condition report.

Field Investigations

At times in-depth field investigations will be warranted to determine the cause of some types of distress. These would usually include coring the pavement or shoulders or investigating foundation or drainage problems. The Regional Materials Engineer is available for investigating pavement problems and the Regional Soils Engineer is available for investigating the shoulders, roadway foundation and drainage. The information and data (in summary form) and conclusions obtained from the investigation shall be part of the final report.

Condition Report

The information obtained from the pavement survey, consultation with the Highway Maintenance Resident Engineer and any field investigation shall be condensed into a final pavement and shoulder condition report. It shall be a brief narrative stating the severity and extent of each type of distress appearing in the pavement. The same shall be done for shoulders. Figure 5 shows the format of the condition report.

BR-47(3/84) NYSDOT DISTRESS DATA FORM RIGID PAVEMENT

Region_____ County_____ Route No._____ Direction_____ PIN_____

Number of Lanes_____ Survey Pertinent to_____Lane(s) _____

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg								
		End								
JOINT SEALER FAILURE	N	None								
	F	Failed								
TRANSVERSE JOINT FAULTING (Measure)	N	None								
	L	1/8"-1/4"								
	M	3/8"-3/4"								
	H	> 3/4"								
TRANSVERSE JOINT DISTRESS (# AFFECTED)	SPALLS N	NO SPALLS								
	SPALLS L	Minor < 3" wide								
	SPALLS M	Occas. > 3" wide								
	SPALLS H	Many > 3" wide								
		Separated								
LONGITUDINAL JOINT DISTRESS (# SLABS AFFECTED)	SPALLS N	NO SPALLS								
	SPALLS L	Minor < 2" wide								
	SPALLS M	Occas. > 2" wide								
	SPALLS H	Many > 2" wide								
		Separated and/or Faulted								
SLAB CRACKING (# SLABS AFFECTED)	N	None								
	L	Light								
	M	Moderate								
	H	Heavy								
WHEELPATH WEAR (Measure)	N	None								
	L	1/4"-3/8"								
	M	1/2"-3/4"								
	H	> 3/4"								
SCALING/ NON-JT. SPALLING (# SLABS)	N	None								
	L	Light								
	M	Medium								
	H	Heavy								
SETTLEMENTS/ HEAVES		None								
		Objectional Ride								
BLOWUPS		Partial Width								
		Full Width								
ASPHALT CONCRETE OVERLAY PATCHING	N	None								
	L	Good								
	M	Fair								
	H	Poor								

SHOULDER SURVEY PERTINENT TO: BOTH___ RIGHT___ LEFT___ SHOULDERS

SHOULDER DETERIORATION	N	None								
	L	Minor Cracking								
	M	Severe Crack ≤ 3ft								
	H	Severe Crack								
LANE/SHOULDER SEPARATION	N	None								
	L	< 1/4"/Sealed								
	M	1/4"-1"								
	H	> 1"								
LANE/SHOULDER DROPOFF	N	None								
	L	1/4"-3/4"								
	M	1"-2"								
	H	> 2"								
SHOULDER DEFORMATION	N	None								
	S	Severe								

Date Insp.___ Inspectors_____ Sheet___of___

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NYSDOT DISTRESS DATA FORM FLEXIBLE PAVEMENT

Region _____ County _____ Route No. _____ Direction _____ PIN _____

Number of Lanes _____ Survey Pertinent to _____ Lane(s) _____

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg								
		End								
WHEELPATH CRACKING (%)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Alligator								
EDGE CRACKING (%)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Spalled								
FULLWIDTH TRANSVERSE CRACKING (#)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Spalled								
LONGITUDINAL CRACKING (%)	N	None								
	L	< 1/4"								
	M	1/4"-1/Secondary								
	H	>1"/Spalled								
CRACKING OTHER (%)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Spalled								
RAVELLING (%)	N	None								
	S	Severe								
WHEELPATH RUTTING (✓)	N	None								
	L	1/4"-3/8"								
	M	1/2"-3/4"								
	H	>3/4"								
CORRUGATIONS (%)	N	None								
	S	Object. Ride								
SETTLEMENT & HEAVES (#)	N	None								
	S	Object. Ride								
ASPHALT CONC. OVERLAY OR SPRAY PATCH (#)	N	None								
	L	Good								
	M	Fair								
	H	Poor								

SHOULDER SURVEY PERTINENT TO: BOTH___ RIGHT___ LEFT___ SHOULDERS

SHOULDER DETERIORATION (%)	N	None								
	L	Minor Cracking								
	M	Severe Crack ≤ 3'								
	H	Severe Crack								
LANE/SHOULDER SEPARATION (%)	N	None								
	L	< 1/4"/Sealed								
	M	1/4"-1"								
	H	>1"								
LANE/SHOULDER DROPOFF (%)	N	None								
	L	1/4"-3/4"								
	M	1"-2"								
	H	>2"								
SHOULDER (%) DEFORMATION	N	None								
	S	Severe								

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NYSDOT DISTRESS DATA FORM FLEXIBLE/RIGID PAVEMENT

Region _____ County _____ Route No. _____ Direction _____ PIN _____

Number of Lanes _____ Survey Pertinent to _____ Lane(s) _____

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	%	REMARKS
		Beg								
		End								
WHEELPATH CRACKING (%)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Alligator								
TRANSVERSE JOINT CRACKING (#)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Spalled								
TRANSVERSE JOINT FAULTING (✓)	N	None								
	L	1/8"-1/4"								
	M	3/8"-3/4"								
	H	>3/4"								
LONGITUDINAL JOINT CRACKING (%)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Spalled								
REFLECTIVE CRACKING (OTHER) (#)	N	None								
	L	< 1/4"								
	M	1/4"-1"/Secondary								
	H	>1"/Alligator								
SLIPPAGE CRACKS (✓)	N	None								
	P	Present								
RAVELLING (%)	N	None								
	S	Severe								
WHEELPATH RUTTING (✓)	N	None								
	L	1/4"-3/8"								
	M	1/2"-3/4"								
	H	>3/4"								
CORRUGATIONS (%)	N	None								
	S	Object. Ride								
SETTLEMENTS & HEAVES (#)	N	None								
	S	Object. Ride								
WIDENING DROPOFF (%)	N	None								
	L	1/4"- 1/2"								
	M	5/8"-1"								
	H	>1"								
ASPHALT CONC. OVERLAY OR SPRAY PATCH (#)	N	None								
	L	Good								
	M	Fair								
	H	Poor								

SHOULDER SURVEY PERTINENT TO: BOTH___ RIGHT___ LEFT___ SHOULDERS

SHOULDER DETERIORATION (%)	N	None								
	L	Minor Cracking								
	M	Severe Crack ≤ 3"								
	H	Severe Crack								
LANE/SHOULDER SEPARATION (%)	N	None								
	L	<1/4"/S aled								
	M	1/4"-1"								
	H	>1"								
LANE/SHOULDER DROPOFF (%)	N	None								
	L	[illegible]"-3/4"								
	M	1"-2"								
	H	>2"								
SHOULDER (%) DETERIORATION	N	None								
	S	Severe								

Date Insp. ___ ___ ___ Inspectors _____ Sheet ___ of ___

CONDITION REPORT

Pavement (summarize severity and extent for each type of distress appearing in the pavement)

Shoulder (summarize severity and extent for each type of distress appearing in the shoulders)

Foundation (summarize foundation problems)

Drainage (summarize drainage problems)

Figure 5

REHABILITATION ALTERNATIVES

A list of appropriate rehabilitation alternatives shall be prepared for the proposed project. A list of pavement restoration techniques is provided EI 84-16 which describes the treatment, its application and unit cost. The listing identifies standard treatments and those which are in the development stage. Some projects will require treatments specifically designed for the project.

Once the alternate rehabilitation treatments are selected, a design life shall be assigned to each alternative. If a design life has not been established for a particular treatment, engineering judgement shall be used. The cost of each alternative shall be established. Life cycle costs shall be computed for each alternative in the form of annual cost. The annual cost shall be computed for one mile of rehabilitation work. Figure 6 shows the format for listing and analyzing rehabilitation treatments.

RECOMMENDED TREATMENT

After the rehabilitation alternatives have been analysed, the most cost effective treatment should be recommended. If the lowest annual cost treatment is not recommended, reasons should be given for the recommended treatment.

REHABILITATION ALTERNATIVES

(Describe suitable alternate treatments. For each alternate, indicate estimated service life of treatment and give estimate of cost for treatment-$lane/mile)

RECOMENDED TREATMENT

Figure 6

ACKNOWLEDGEMENTS

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APPENDIX I

General Instructions for Completing Distress Data Forms

This section gives general instructions for completing the Distress Data Forms. The instructions are outlined from top to bottom of the form and are broken-down into five major sections:

1. Heading
2. Evaluation
3. Distress Data Collection Procedure
4. Remarks
5. Shoulder Survey Heading

HEADING SECTION

The heading information is identical for all pavement type distress data forms. The following details the information to be recorded in the heading.

Region, County, and Route No. - Pertinent to the survey location.

Direction - The direction of travel while conducting the evaluation. This should be reported as (North, South, East, or West). For undivided highways this identifies which lane is used for conducting the detailed survey. For example, a two way East/West roadway for which the direction of travel is east would have the Eastbound lane and its adjacent shoulder used to conduct the detailed survey.

PIN - Project Identification Number. A previously determined number to identify the proposed project to be evaluated.

Number of Lanes - The total number of lanes in both directions on an undivided highway or the total number of lanes in the direction of the evaluation on a divided highway. If the highway is divided denote it with a (D) after the number of lanes.

Survey Pertinent to Lane(s) - The number of lane(s) that exhibit the distress indicated on the form, and which lanes they are. (All - all lanes; DL - driving lane; CL - center lane; PL - passing lane.)

SEE FIGURES 1 & 2 FOR EXAMPLES OF TYPICAL HEADING COMPLETIONS.

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NYSDOT DISTRESS DATA FORM FLEXIBLE PAVEMENT

Region 1 County Saratoga Route No. 187 Direction North PIN 158753

Number of Lanes 3(D) Survey Pertinent to 2 Lane(s) DL, C

Figure 1

Figure 1 is an example of a three-lane divided highway. The evaluation was conducted on the northbound lanes and was pertinent to only two of the three lanes, those being the driving lane (DL) and the center lane (CL). The passing lane (PL) did not exhibit the same types and/or severity levels of distress as the other lanes, and therefore would be evaluated separately.

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NYSDOT DISTRESS DATA FORM FLEXIBLE PAVEMENT

Region 1 County Essex Route No. 22 Direction South PIN 175252

Number of Lanes 2 Survey Pertinent to 2 Lane(s) All

Figure 2

Figure 2 is an example of a two lane undivided highway. The evaluation was conducted on the southbound lane and was pertinent to both north and southbound lanes. (Both lanes exhibited similar distress.)

EVALUATION SECTION

Record the 4 digits from the bottom row of the roadside reference marker. These numbers shall be recorded for both the beginning (BEG) and ending (END) point of each ½ mile section. The detailed survey will then be conducted on the first tenth mile segment of the ½ mile sections, unless the tenth mile segment is obstructed with a bridge or intersection as previously explained under Distress Data Collection. See Figure 3 for a typical example.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020	Σ	%	
		End	1005	1010	1015	1020	1025			

Figure 3

DISTRESS DATA COLLECTION PROCEDURE

Each distress category and severity level is defined under the distress descriptions sections in Appendices II - V. These sections should be referred to for the specific method of measuring and determining the severity and extent of distress. Photos are included to aid in determining the different severity levels.

Three different methods of recording or measuring distress and severity are used as follows:

1. Percentage Estimation (%)
2. Numerical Count (#)
3. Indication of Presence (✓)

The method used to measure the extent of distress is indicated by the symbols above on the Distress Data Form and also is explained in the distress descriptions sections under How to Measure.

1. Percentage Estimation - is used primarily on the Flexible and Flexible/-Rigid pavement distress data forms. The percentage concept is used to estimate the percentage of a particular type of distress and severity level that exists within the tenth mile detailed survey section. It is generally an estimate of the survey pavement length affected. Refer to the distress description sections for the specific method of measuring and determining the severity and extent of distress. The estimated percentage is documented on the data form by entering a number from 1 to 10 in the appropriate boxes; 1 represents 10%, 2 represents 20%, up to 10 which would represent 100%. If no distress is present in a detailed survey section a 10 (100%) is recorded in the none box. Note - for each type of distress the summation of the individual severity levels for each ½ mile section evaluated should equal 10. See Figure 4 for a typical example.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH CRACKING (%)	N	None	6		1			7	14	
	L	< 1/4"	4	8	5	6	5	28	56	
	M	1/4"-1"/Secondary		2	4	4	5	15	30	
	H	> 1"/Alligator								
Note ⟶			10	10	10	10	10			

Figure 4

2. Numerical Count - is used for those forms of distress that are discreet in their occurrences, such as settlements and heaves, blowups, transverse joint distress, etc. Each level of severity should be counted and noted for the appropriate distress categories. Refer to the Distress Descriptions Section for the specific method of measuring and determining the severity and extent of distress. Some forms of distress are counted within the 1/10 mile detail survey section only, while others are counted for the entire ½ mile survey section. If no distress is present indicate this with a checkmark in the None category. See Figure 5 for a typical example.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
TRANSVERSE JOINT CRACKING (#)	N	None	✓							
	L	< 1/4"		3	2			5		
	M	1/4"-1"/Secondary			4	4	6	14		
	H	> 1"/Spalled				2		2		

Figure 5

3. Indication of Presence - for this method of measuring and recording distress use a checkmark in the appropriate distress category and severity level. Refer to the distress descriptions sections for the specific methods of measuring to determine the severity level present. If no distress is present indicate this with a checkmark in the None category. See Figure 6 for a typical example.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH RUTTING (✓)	N	None	✓					1	20	
	L	1/4"-3/8"		✓	✓		✓	3	60	
	M	1/2"-3/4"				✓		1	20	
	H	>3/4"								

Figure 6

Extent Totals - After the entire project has been evaluated the ratings for each section shall be summed up for each individual severity level and the total placed in the summation ( ) box on the last form. For distress types that are measured by either using a Percentage Estimation or an Indication of Presence (checkmark), a percent (%) of distress is calculated. To calculate the percent (%) of distress the summation ( ) totals are divided by the number of sections and then multiplied by 10 (for distress types using a Percentage Estimation) or 100 (for distress types using an Indication of Presence), the quotient is then entered in the percent (%) column to the nearest whole number. Examples of calculating project totals are shown in the distress description section for each of the distress categories.

For those distress categories where project percentages would be misleading such as a non-uniform type of distress, the percent column in blacked out and therefore should not be calculated.

REMARKS SECTION

Any narrative remarks concerning a section should be made in this space referring to the section by the numbers indicated in the parenthesis under the section heading. Remarks could include differences in distress levels from one lane to another, unusual road conditions not recorded on the form, differences in distress levels between right and left shoulders, or any information that the inspectors feel may be pertinent to the evaluation. See Figure 7 for a typical example.

DISTRESS	SEVERITY		SECTION Beg / End	(1) 1000 / 1005	(2) 1005 / 1010	(3) 1010 / 1015	(4) 1015 / 1020	(5) 1020 / 1025	EXTENT TOTAL #	EXTENT TOTAL %	REMARKS
EDGE CRACKING (%)	N	None		10	10	4	2	3	29	58	(2) M-SEVERITY LEVEL ASSOCIATED WITH RIGHT PAV'T EDGE ONLY.
	L	< 1/4"				4	8	6	18	36	
	M	1/4"-1"/Secondary				2		1	3	6	
	H	> 1"/Spalled									

Figure 7

SHOULDER SURVEY HEADING

SHOULDER SURVEY PERTINENT TO: BOTH ✓ RIGHT___ LEFT___ SHOULDERS

Check off which side(s) exhibit the distress indicated on the form.

SHOULDER DISTRESS DATA COLLECTION PROCEDURE

This section is completed following the same directions outlined for the pavement distress data collection. Refer to the shoulder distress descriptions section - Appendix 5 for specific methods of measuring and determining the severity and extent of distress.

This ends Appendix 1 - General Instructions for Completing Distress Data Forms.

APPENDIX II

Distress Data Collection Procedures

Rigid Pavement

General Note:

There are three distress types which have severity levels based on a sixty foot length of pavement (Longitudinal Joint Distress, Slab Cracking and Scaling/Non Joint Spalling). The reason for this is the vast majority of PCC pavements constructed in recent years were built using 60'-10" or 63' long slabs. These slab lengths should be treated as 60' in length to simplify the evaluation. Occasionally, however, the evaluator may encounter either shorter slabs (20'-43') or longer slabs (70'-100'+). When this occurs the evaluator will have to proportion the severity level distress extent to conform to the slab lengths being observed. In doing this, the following rules should be observed to maintain consistency statewide:

1. Three 20' long slabs should be considered as one 60' long slab.

2. Two 30' long slabs should be considered as one 60' long slab.

3. Slabs 43' to 70' in length should be considered as being 60' in length.

4. Slabs 90'-100'+ in length should be considered as being two 60' long slabs.

JOINT SEALER FAILURE

Description:

Liquid Sealers - Failure is characterized by loss of bond (adhesion) between the sealer and joint faces, internal tearing (cohesion) within the sealer itself and/or entrapment of incompressibles within the sealer matrix and/or loss of sealer from the joint.

Preformed Neoprene Sealers - Failure is characterized by loss of recovery from a compressed state (compression set) and/or internal web sticking, allowing the infiltration of water and incompressibles into the joint and/or loss of sealer from the joint.

Causes:

When the major portion of New York's PCC pavements were being constructed in the 1960s, little was known about the relationship between joint width and slab length. In addition, the joint sealers available at the time lacked the flexibility and recoverability characteristics needed to perform satisfactorily for an extended period of time when exposed to environmental extremes. This lack of knowledge also extended to construction, resulting in inadequate joint groove preparation prior to sealing, and poor sealer installation practices. Consequently, joint sealers failed within a short period of time. To further complicate this problem, maintenance and replacement of failed joint sealers with suitable materials has been practically non-existant.

Severity Level:

Determine through observation whether or not joint sealers have failed.

In some instances sealer failure is unmistakably evident, as the entire sealer may be missing. However, many times sealers appear to be functioning but, in fact, have exceeded their serviceable life. This generally occurs if observations are made during warm periods when pavement joints are at their narrowest because of slab expansion. At this time of year, gaps caused by cohesion failure, loss of adhesion and compression set may not be discernable. However, they can easily be detected with a thin bladed putty knife or similar instrument used as a probe to detect these gaps. It is also very helpful to cut and remove a section of sealer from the joint. This allows inspection of the joint grooves and liquid sealers for infiltration of incompressibles and the inspection of preformed sealers for compression set.

How to Measure:

Check category which represents 1/10th mile detail survey section.

DISTRESS	SEVERITY		SECTION	(1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
			Beg	1000	1005	1010	1015	1020			
			End	1005	1010	1015	1020	1025	Σ	%	
JOINT SEALER FAILURE	N	None									
	F	Failed		✓	✓	✓	✓	✓	5	100	

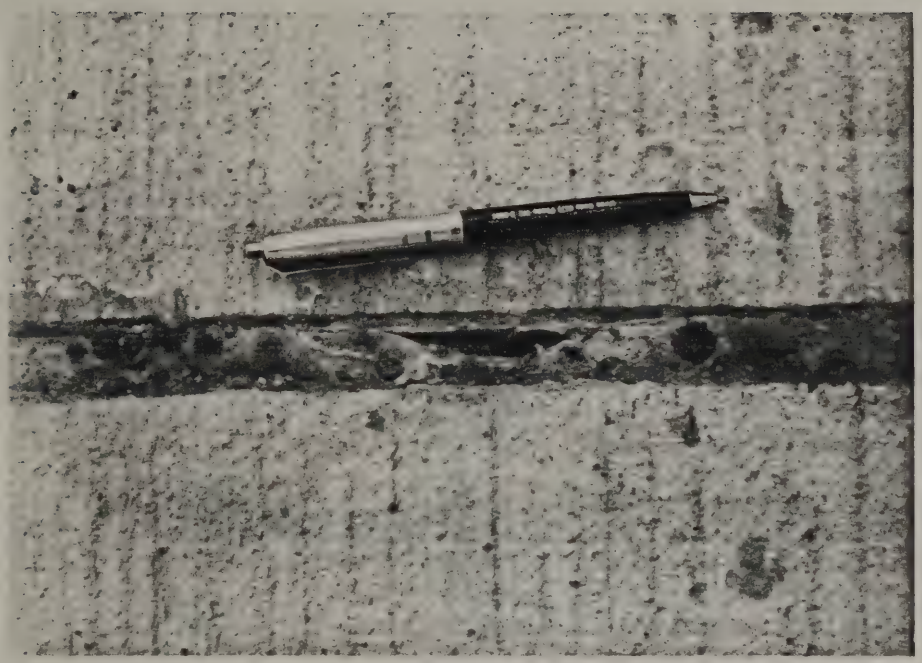
$$\% = \frac{\Sigma \text{ of } \checkmark \text{ per severity level}}{\Sigma \text{ of number of sections evaluated}} \times 100$$

Adhesion Failure

Cohesion Failure

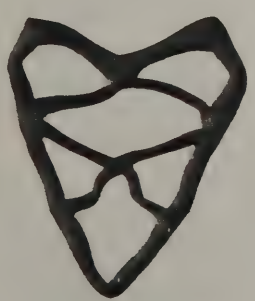
Broken From Stretching During
Installation

Compression Set Failure allowing
the infiltration of incompressible
materials



Incompressible Infiltration

Preformed



New Sealer (Compression Set, Web Sticking)

Failed Sealer

TRANSVERSE JOINT FAULTING

Description: Differential vertical displacement of abutting slabs at joints or slab cracks creating a step deformation on the pavement surface.

Cause: Loss of load transfer caused by a combination of; unsealed joints, which allow water and deicing salts to penetrate, traffic loads and load transfer device design. Salts cause corrosion of the malleable iron type load transfer device which are weakened due to metal loss and eventually fracture and fail due to traffic loads. The water weakens the subgrade which is displaced by traffic loadings in the area. Faulting progresses with time as subgrade material is displaced due to water weakened soil and continuing traffic loads.

Severity Level:

- **Low** — Elevation difference between 1/8" and 1/4"
- **Medium** — Elevation difference between 3/8" and 3/4"
- **High** — Elevation greater than 3/4"

How to Measure: Measurement should be taken 1 foot from the edge of pavement lane with a combination square as shown in photo. Measure to nearest 1/8 inch at 5 transverse joints, during 1/10 mile detail survey. Checkmark category in which majority of measurements fall as shown in the example.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
TRANSVERSE JOINT FAULTING (Measure)	N	None						0	0	
	L	1/8"-1/4"	✓	✓		✓		3	60	
	M	3/8"-3/4"			✓			1	20	
	H	>3/4"					✓	1	20	

$$\% = \frac{\Sigma \text{ of } \checkmark \text{ per severity level}}{\Sigma \text{ of number of sections evaluated}} \times 100$$

Transverse Joint Faulting

TRANSVERSE JOINT DISTRESS

Description: Spalling

A piece of concrete joint edge which has cracked and broken away from the slab. Spalls may range in size from minor chips to large pieces constituting major joint damage. Spalls usually do not extend through the thickness of the slab but meet the joint at an angle. Spalls may be patched with asphalt concrete.

Cause: Spalling is due to an internal or external force on concrete which causes it to fracture.

An internal force due to metal corrosion and/or expansion of absorptive aggregates will cause spalling.

An external force, such as a stone or other incompressible caught in the joint between expanding slabs, will create enough stress to cause chipping or a large piece of concrete to break away. Ice expanding in a crack will also cause stress and result in spalling.

Severity Level:

Low — A minor spall with a maximum width dimension of three inches. This dimension is measured from the joint face to the edge of the spall. Chipping of the joint face would fall in this category. Joints with chipping or minor spalls as defined above would be able to be sealed with a poured sealer.

Medium — Two or less spalls per joint whose width dimension is greater than the 3 inches in the Low severity level. A joint falling in this category would be able to be sealed with a pourable sealer after the spalls are permanently repaired.

High — Three or more spalls per per joint whose width dimension is greater than the 3 inches in the Low severity level. A joint falling in this category is so extensively deteriorated that the most cost effective solution may be asphalt patching followed by an asphalt overlay.

TRANSVERSE JOINT DISTRESS

Description: Separated

A transverse joint which has widened to 2 inches and/or beyond.

Cause: Infiltration of incompressible material during the contraction cycle of the pavement slabs. As slabs move toward blowups and/or pressure relief joints, space is provided for continued infiltration increasing widening.

How to Measure: Spalling

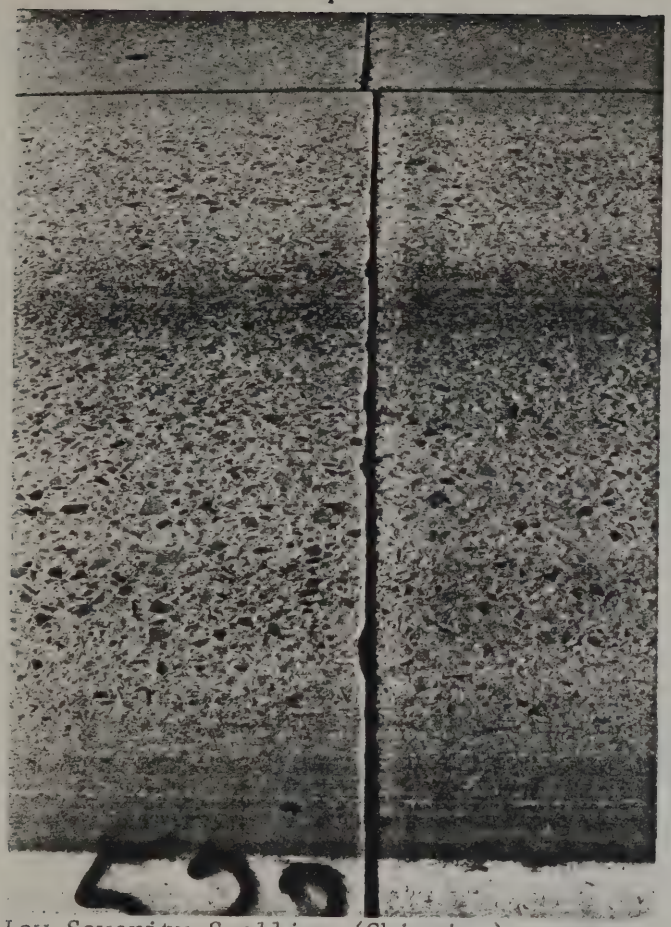
The number of joints falling in each severity level are tallied during the 1/10 mile detail survey as shown in the example.

How to Measure: Separated

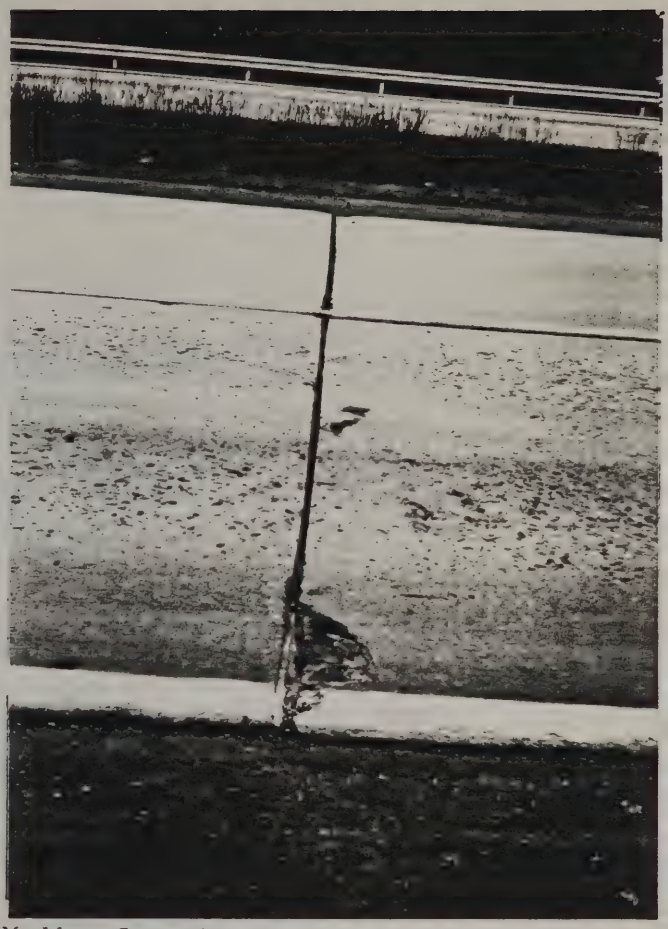
The number of joints in each 1/10 mile detail survey, two inches or greater are tallied.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
TRANSVERSE JOINT DISTRESS (# AFFECTED)	SPALLS N	NO SPALLS						0	0	
	SPALLS L	Minor < 3" wide			IIII			4	9	
	SPALLS M	Occas. > 3" wide	/////	///// II	/////	///// IIII	IIII	30	67	
	SPALLS H	Many > 3" wide	IIII	II			/////	11	24	
	Separated		///// II			IIII	/////	16	35	

$$\% = \frac{\Sigma \text{ of joints (counts) per severity level}}{9 \text{ joints/section} \times \text{number of sections}} \times 100$$



Low Severity Spalling (Chipping)



Medium Severity Spalling

High Severity Spalling

Note the severity of wheelpath wear as shown by the varying degrees of exposed large aggregates in the three examples above.

0

Separated

LONGITUDINAL JOINT DISTRESS

Description: Spalling

See Transverse Joint Distress

Cause: See Transverse Joint Distress

Severity Level:

Low — Minor spalls or chipping with a maximum width dimension of two inches. Joints at this severity level would be able to be sealed with a pourable sealer.

Medium — Two or less spalls per sixty foot length of pavement having a width dimension greater than two inches. A joint falling in this category would be able to be sealed with a pourable sealer after the spalls are permanently repaired.

High — Three or more spalls per sixty foot length of pavement having a width dimension greater than two inches. A length of pavement falling in this category is so extensively deteriorated that the most cost effective solution may be asphalt patching followed by an asphalt overlay.

Separated and/or Faulted

Description: A longitudinal joint which has widened to 1 inch or greater and/or faulted.

Cause: Failure of the two piece longitudinal joint ties between pavement lanes due to corrosion, infiltration, and independent movement of pavement lanes (see Blowups).

Spalling

How to Measure: The number of pavement slabs (60' nominal) falling in each severity level are tallied doing the 1/10th mile detail survey.

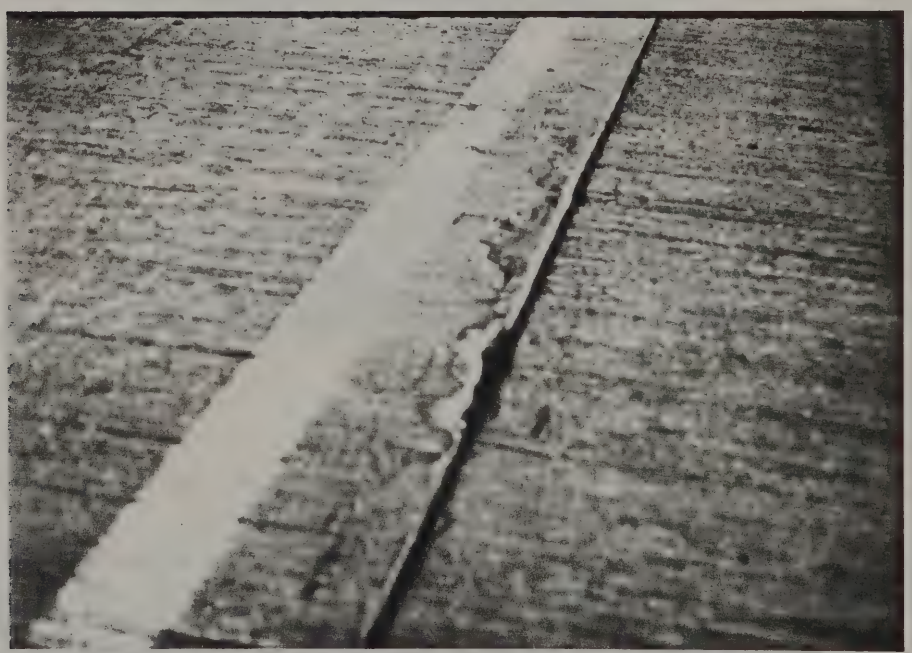
Separated and/or Faulted

The number of pavement slabs (60' nominal) in each 1/2 mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
LONGITUDINAL JOINT DISTRESS (NO. OF SLABS AFFECTED)	SPALLS N	NO SPALLS		III	++++	IIII	+++ III	20	50	
	SPALLS L	Minor < 2" wide	+++	IIII	II	III		14	35	
	SPALLS M	Occas. > 2" wide	II	I	I	I		5	13	
	SPALLS H	Many > 2" wide	I					1	2	
	Separated and/or Faulted					+++	+++	10	25	

$$\% = \frac{\Sigma \text{ of slabs (counts)}}{8 \text{ sixty ft. slabs/section} \times \text{number of sections}} \times 100$$

Minor Severity Spalling or Chipping



Medium Severity Spalling

High Severity Spalling

Separated and/or Faulted

SLAB CRACKING

Description: A crack or cracks within a pavement slab that propagate in any direction. Cracks may vary from hairline to more than one inch in width.

Causes: Slab cracking is common. It may occur either early in the life of a pavement or later after the pavement has been subjected to the action of the environment and traffic loading. Cracking that occurs early can usually be attributed to poor construction practices such as improper handling and placement of load transfer devices, improper curing and/or sawing joints too late. Cracking occuring later can usually be attributed to load transfer lockup or loss, loss of subbase support and/or excessive loading.

Severity Levels:

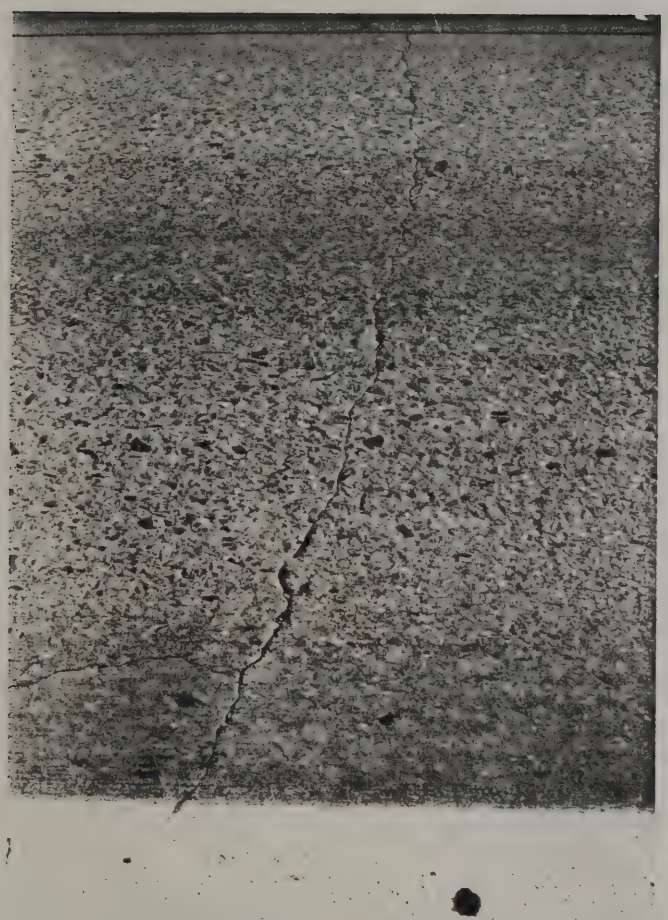
- **Low** — Cracks less than 1/8" in width generally free of spalls, have not faulted and/or do not open and close with changes in temperature.
- **Medium** — Cracks 1/8" or greater in width generally free of spalls and/or have not faulted that can be effectively cleaned, and sealed.
- **High** — Cracks 1/8" or greater in width which are spalled and/or faulted and cannot be effectively cleaned and sealed. Generally slabs containing cracks of this magnitude should be broken and seated and overlaid or replaced.

How to Measure: Tally and note the number of cracked slabs that are in each category in the 1/10 mile long detail survey section.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
SLAB CRACKING (# SLABS AFFECTED)	N	None	𝍸 |||	𝍸 |||	𝍸	|||		24	60	
	L	Light					𝍸	5	12	
	M	Moderate					|||	3	8	
	H	Heavy			|||	𝍸		8	20	

$$\% = \frac{\Sigma \text{ of slabs (counts)}}{8 \text{ sixty ft. slabs/section X number of sections}} \times 100$$

Medium Severity Cracking



Low Severity Cracking

High Severity Cracking

WHEELPATH WEAR

Description: Loss of mortar and fine aggregate resulting in the exposure and polishing of the larger aggregate and rutting in the wheelpaths of the pavement surface disrupting cross-slope drainage.

Cause: Wear due to winter abrasives and wheel repetitions.

Severity Level: Depth of wear.

How to Measure: Measure depth to the nearest 1/8 inch, in right hand wheel path, at one location during 1/10 mile detail survey. Checkmark category in which measurements fall.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMA
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	Σ	%	
WHEELPATH WEAR (Measure)	N	None								
	L	1/4"-3/8"	✓	✓	✓		✓	4	80	
	M	1/2"-3/4"				✓		1	20	
	H	> 3/4"								

$$\% = \frac{\Sigma \text{ of } \checkmark \text{ per severity level}}{\Sigma \text{ of number of sections evaluated}} \times 100$$

(See photos in Transverse Joint Distress section for examples of wheel path wear)

SCALING/NON-JOINT SPALLING

Description: Irregularities in the pavement slab surface other than those occuring at joints and characterized by scaling, popouts and/or spalling. These distress types may be patched with asphalt.

Cause: Scaling is caused by excessive water used in finishing the concrete's surface or lack of proper amount of entrained air, in combination with freezing and thawing.

Popouts are caused by expansive or absorptive coarse aggregate which spalls the concrete surface.

A common example of spalling is corrosion of pavement reinforcing mesh which causes a spall in the pavement surface. This is prevalent when the cover over the mesh is shallow.

Severity Level:

- **Low** — Minor isolated scaling less than ½ inch deep. No spalling.
- **Medium** — Scaling ½ to 1 inch deep and/or two or less spalls per slab. (spalls or popouts are noted only if greater than 1 square foot in area)
- **High** — Scaling greater than 1 inch deep. Three or more spalls per slab.

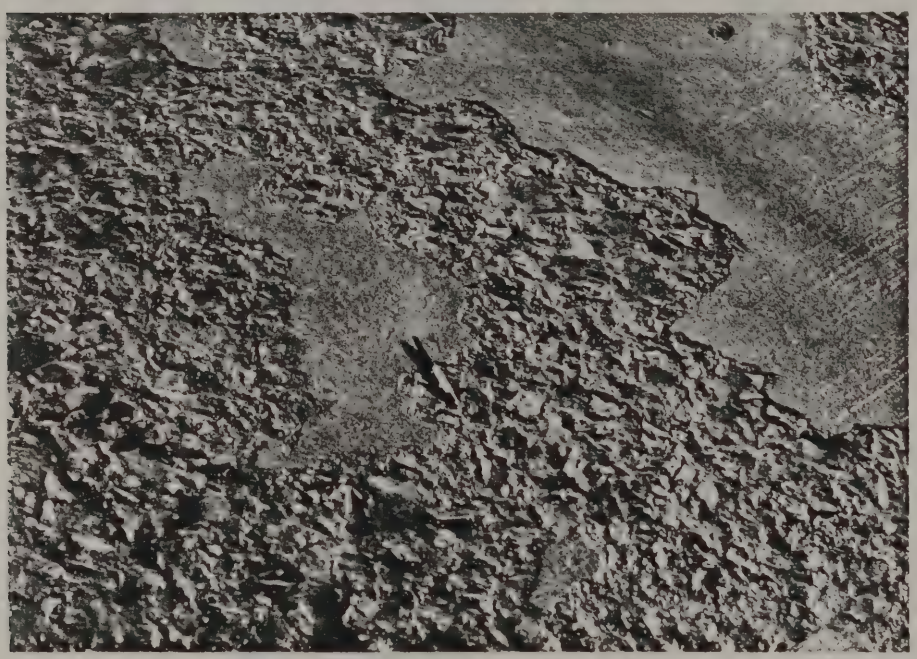
How to Measure: Observe and tally the number of slabs (60') that fall in each severity level during the 1/10 mile detail survey.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
SCALING/ NON-JT. SPALLING (// SLABS)	N	None	///// ///	///// ///	///// ///	///// /	///// //	37	92	(4) Scaling
	L	Light				//		2	5	
	M	Medium					/	1	3	(5) Spalling
	H	Heavy								

refers to section where type of distress appears

$$\% = \frac{\Sigma \text{ of slabs (counts)}}{8 \text{ sixty ft. slabs/section X number of sections}} \times 100$$

Low Severity
Scaling



Medium Scaling -
Showing deterioration
or mortar

Medium Spalling - due to
corrosion product pressure
and shallow concrete cover
of reinforcing mesh

SETTLEMENTS AND HEAVES

Description: Settlements are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. Heaves are localized upward displacements of the pavement surface.

Possible Causes:
1. Frost action (heaves)
2. Settlement of the subgrade

Severity Levels: No degrees of severity are defined. Settlements and heaves should be noted only when they result in an objectionable ride.

How to Measure: Record as the number of settlements and/or heaves counted in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	Σ	%	
SETTLEMENTS/ HEAVES	None									
	Objectional Ride				1	1		2		

% = DO NOT CALCULATE

Settlement

BLOWUPS

Description: A localized buckling or shattering of a slab generally occuring at a transverse joint or crack which may or may not have been patched with bituminous concrete.

Cause: An infiltration of fines in unsealed transverse joints which acts as an incompressible medium. This incompressible medium will buildup due to the normal contraction which takes place in cold weather and the infiltration of abrasive sand and roadway dirt. The normal expansion during warmer weather will cause compressive stresses which are relieved when the pavement buckles or shatters.

Since blowups may not occur in all the lanes of a multilane pavement, shearing forces develop in the longitudinal joints as lanes move independently. These forces cause the two-component longitudinal tie bars to bend and shear off. Once the lanes are no longer tied together, further separation occurs at the longitudinal joint as infiltration continues.

Severity Level: A partial width blowup occurs in one or some of the lanes of a multi lane pavement. It does not extend across the full pavement width. Adjacent transverse joints will be seen to be misaligned as the slabs move toward the pressure relief caused by the blowup. A full width blowup occurs across the entire pavement width and does not cause transverse joint misalignment.

How to Measure: Tally and note number in each category in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
BLOWUPS	Partial Width					1	1	2		
	Full Width		1					1		

% = DO NOT CALCULATE

Blowup showing shattered concrete before repair

Partial width blowup that occurred in the near lanes only and has been repaired with asphalt concrete

ASPHALT CONCRETE OVERLAY PATCHING

Description: A lane or full pavement width, paver laid, asphalt concrete patch placed to improve rideability over localized distress. May be over one or two slabs or several hundred feet long.

Cause: A localized settlement and/or excessively cracked, sealed or spalled pavement slab.

Severity Level:

Good — Like new. Original condition of asphalt concrete overlay.

Fair — Underlying problem reflecting through. Cracks showing, potholes, spot patching by Maintenance forces.

Poor — No longer serviceable, extensive deterioration has reflected through or the asphalt concrete has deteriorated to the extent where replacement is necessary.

How to Measure: Tally and note approximate length of each patch under remarks in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
ASPHALT CONCRETE OVERLAY PATCHING	N	None		✓	✓	✓				(1) 120' patch
	L	Good								
	M	Fair					11	2		(5) 180' & 240' patches
	H	Poor	1					1		

refers to section where distress appears

% = DO NOT CALCULATE

Good

Fair

Poor

NYSDOT DISTRESS DATA FORM RIGID PAVEMENT

Region 12 County EXCELSIOR Route No. 99 Direction N PIN 1201.50

Number of Lanes 2 (0) Survey Pertinent to 2 lane(s) ALL

DISTRESS		SEVERITY	Beg / End	SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
			Beg	1000	1005	1010	1015	1020			
			End	1005	1010	1015	1020	1025			
JOINT SEALER FAILURE	N	None									
	F	Failed		✓	✓	✓	✓	✓	5	100	
TRANSVERSE JOINT FAULTING (Measure)	N	None							0	0	
	L	1/8"-1/4"		✓	✓		✓		3	60	
	M	3/8"-3/4"				✓			1	20	
	H	> 3/4"						✓	1	20	
TRANSVERSE JOINT DISTRESS (# AFFECTED)	SPALLS N	NO SPALLS							0	0	
	SPALLS L	Minor < 3" wide				////			4	9	
	SPALLS M	Occas. > 3" wide		////	//// //	////	//// ////	////	30	67	
	SPALLS H	Many > 3" wide		////	//			////	11	24	
		Separated		//// //			////	////	16	35	
LONGITUDINAL JOINT DISTRESS (# SLABS AFFECTED)	SPALLS N	NO SPALLS			///	////	////	//// ///	20	50	
	SPALLS L	Minor < 2" wide		////	////	//	///		14	35	
	SPALLS M	Occas. > 2" wide		//	/	/	/		5	13	
	SPALLS H	Many > 2" wide		/					1	2	
		Separated and/or Faulted					////	////	10	25	
SLAB CRACKING (# SLABS AFFECTED)	N	None		//// ///	//// ///	////	///		24	60	
	L	Light						////	5	12	
	M	Moderate						///	3	8	
	H	Heavy				///	////		8	20	
WHEELPATH WEAR (Measure)	N	None									
	L	1/4"-3/8"		✓	✓	✓		✓	4	80	
	M	1/2"-3/4"					✓		1	20	
	H	> 3/4"									
SCALING/ NON-JT. SPALLING (# SLABS)	N	None		//// ///	//// ///	//// ///	//// /	//// //	37	92	(4) Scaling
	L	Light					//		2	5	(5) Spalling
	M	Medium						/	1	3	
	H	Heavy									
SETTLEMENTS/ HEAVES		None									
		Objectional Ride				/	/		2		
BLOWUPS		Partial Width					/	/	2		
		Full Width		/					1		
ASPHALT CONCRETE OVERLAY PATCHING	N	None			✓	✓	✓				(1) 120' patch
	L	Good									(5) 180' & 2 patches
	M	Fair						//	2		
	H	Poor		/					1		

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SHOULDER SURVEY PERTINENT TO: BOTH ___ RIGHT ___ LEFT ___ SHOULDERS

SHOULDER DETERIORATION	N	None								
	L	Minor Cracking								
	M	Severe Crack ≤ 3ft								
	H	Severe Crack								
LANE/SHOULDER SEPARATION	N	None								
	L	< 1/4"/Sealed								
	M	1/4"-1"								
	H	> 1"								
LANE/SHOULDER DROPOFF	N	None								
	L	1/4"-3/4"								
	M	1"-2"								
	H	> 2"								
SHOULDER DEFORMATION	N	None								
	S	Severe								

Date Insp. 4/11/84 Inspectors A. HUNT, W. JUDGE Sheet 1 of 1

APPENDIX III

Distress Data Collection Procedures

Flexible Pavement

WHEEL PATH CRACKING

Description: Visible fractures or separations only within the wheel paths (Approximately 3 foot wide per wheel path). The cracking begins as single or multiple longitudinal cracks which may have some secondary cracking. After repeated traffic loading the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are normally less than 1 foot on the longest side.

Possible Causes: Wheel path cracking is a load related failure of the pavement. Any one or combination of the following may result in wheel path cracking:

1. Unstable subgrade
2. Insufficient pavement thickness
3. Degradation and/or stripping

Severity Levels: Low - Single or multiple longitudinal cracks less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single or multiple longitudinal cracks greater than or euqal to 1/4 of an inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

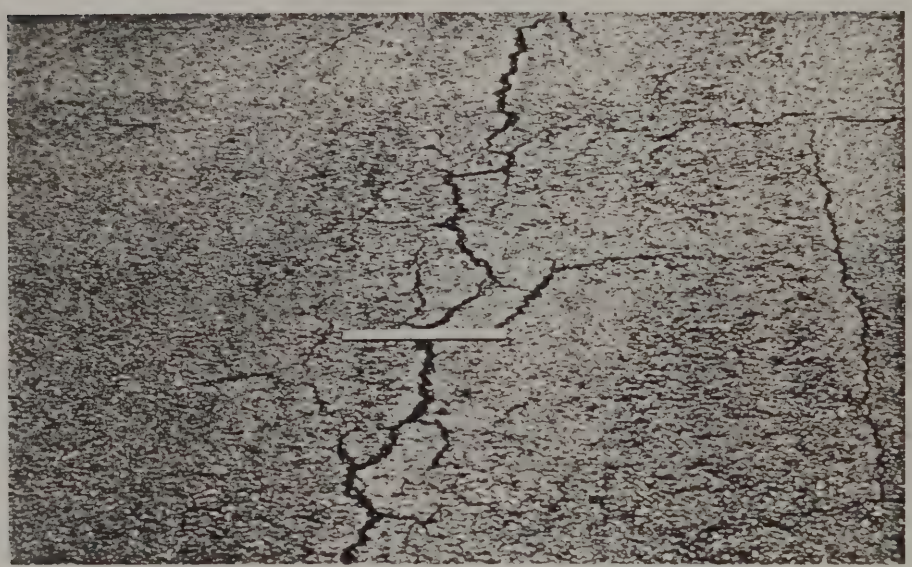
High - Alligator cracking and/or cracks greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of the 500 foot section affected. One wheel path that is cracked for the entire length would represent 100 percent, or cracking over entire length jumping from one wheel path or lane to another would also represent 100 percent.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH CRACKING (%)	N	None	6		1			7	14	
	L	< 1/4"	4	8	5	6	5	28	56	
	M	1/4"-1"/Secondary		2	4	4	5	15	30	
	H	> 1"/Alligator								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Low Severity Wheel Path Cracking



Medium Severity Wheel Path Cracking

High Severity Wheel Path Cracking

EDGE CRACKING

Description: These are longitudinal cracks within 1 to 2 feet of the edge of the pavement with or without transverse cracks branching towards the pavement edge.

Possible Causes:
1. Lack of Lateral (shoulder) support
2. Subgrade failure
3. Frost action

Severity Levels:

Low - Single or multiple cracks less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single or multiple cracks from 1/4 to 1 inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

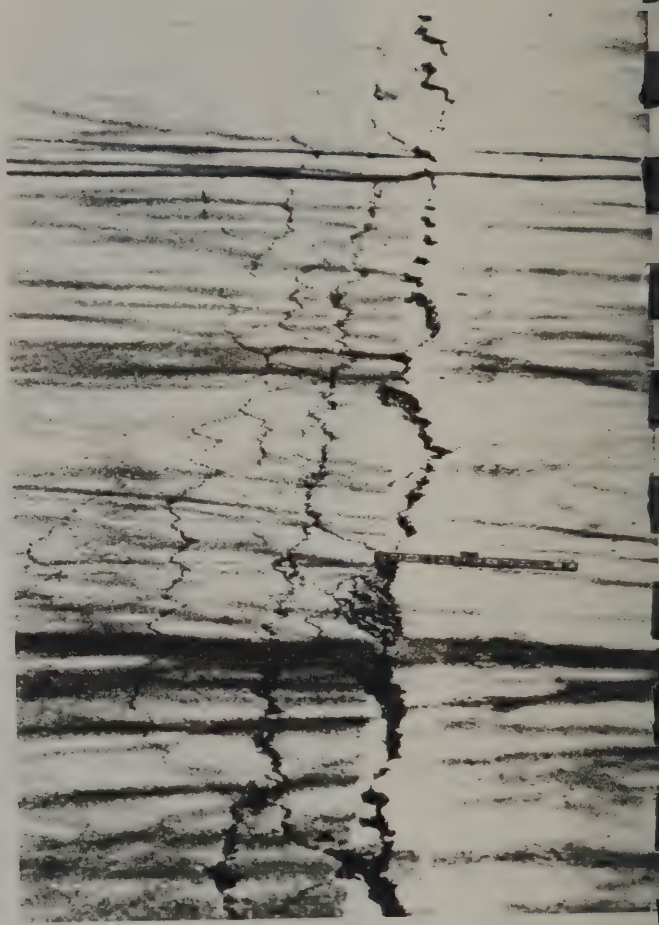
High - Single or multiple cracks greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of the 500 foot section affected. Rate the righthand edge with respect to the survey direction. If significant difference in lefthand edge exists, note under remarks.

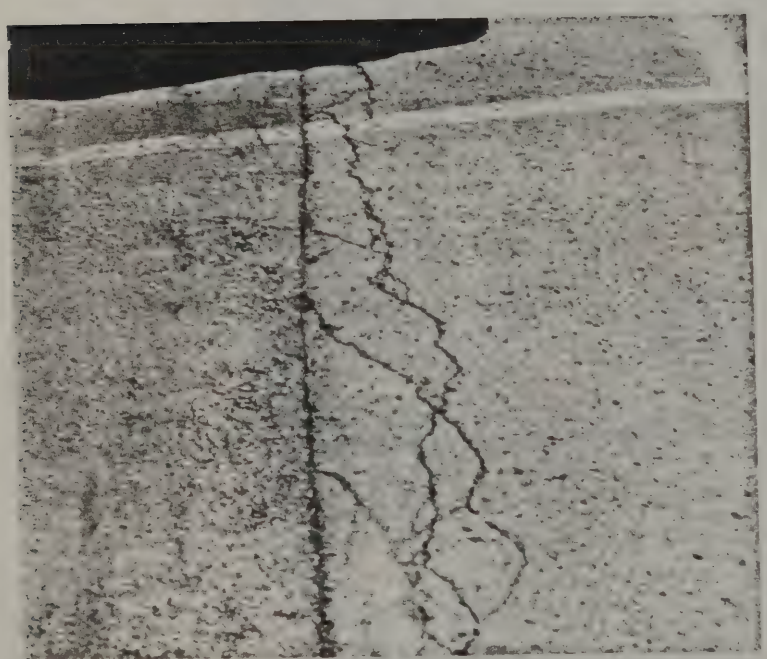
DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
EDGE CRACKING (%)	N	None	10	10	4	2	3	29	58	
	L	< 1/4"			4	8	6	18	36	
	M	1/4"-1"/Secondary			2		1	3	6	
	H	> 1"/Spalled								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Low Severity Edge Cracking



High Severity Edge Cracking



Medium Severity Edge Cracking

FULL WIDTH TRANSVERSE CRACKING

Description: Visible fractures or separations of the pavement surface perpendicular to the pavement centerline extending across the entire pavement.

Possible Causes:

1. Shrinkage due to temperature changes and/or hardening of the asphalt.
2. Frost action.
3. Subgrade settlement or movement.

Severity Levels:

Low - Single crack less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single crack from 1/4 to 1 inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

High - Single crack greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Record as the number of full width transverse cracks counted in the 500 foot section.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
FULLWIDTH TRANSVERSE CRACKING (#)	N	None								
	L	< 1/4"	2	3		2		7		
	M	1/4"-1"/Secondary	4	3	5	4	6	22		
	H	>1"/Spalled		1	2	1	2	6		

% = DO NOT CALCULATE

Low Severity Transverse Cracking

Medium Severity Transverse Cracking

High Severity Transverse Cracking

LONGITUDINAL CRACKING

Description: Visible fractures or separations of the pavement surface parallel to the pavement centerline and at least 20 foot in length. This does not include cracks in the wheel paths (3 foot wide per wheel crack) or cracks within 1 to 2 feet of the edge of pavement.

Possible Causes:
1. A poorly constructed paving lane joint.
2. A load related pavement failure.

Severity Levels:

Low - Single or multiple cracks less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single or multiple cracks from 1/4 to 1 inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

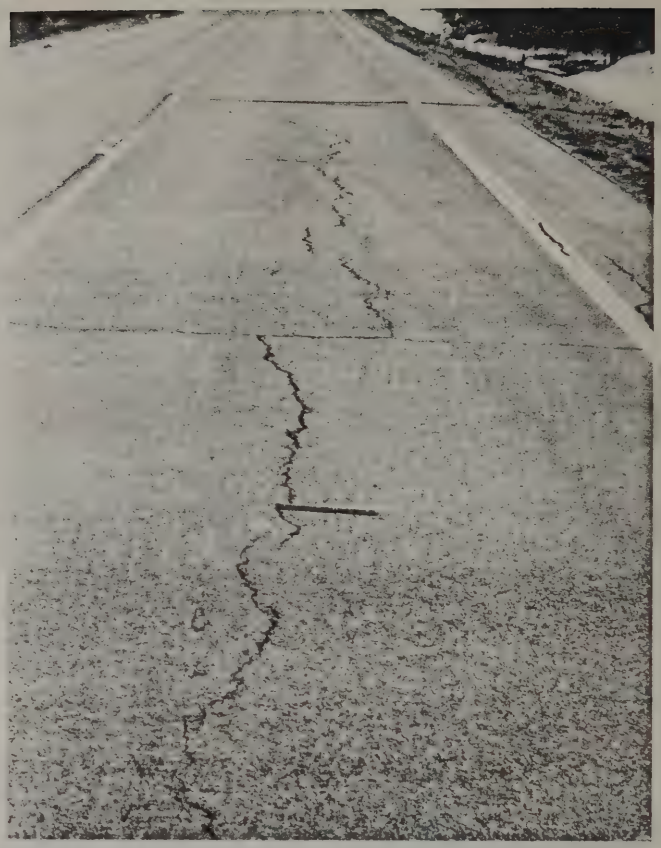
High - Single or multiple cracks greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of the 500 foot section affected. One crack extending the entire length would represent 100 percent.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
LONGITUDINAL CRACKING (%)	N	None	10	10			2	22	44	
	L	< 1/4"			8	6	1	15	30	
	M	1/4"-1/Secondary			2	4	7	13	26	
	H	>1"/Spalled								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Low Severity Longitudinal Cracking



Medium Severity Longitudinal Cracking

High Severity Longitudinal Cracking

CRACKING (OTHER)

Description: Visible fractures or separations of the pavement surface either Longitudinal (parallel to the pavement centerline), less then 20 feet in length; Transverse (perpendicular to the pavement centerline), less then full width, or block cracking (a series of interconnecting cracks forming rectangular blocks ranging in size from 1 square foot to 20 square feet). The cracking (other) category does not include cracks in the wheel paths (3 foot areas) or within 2 feet of the edges of the pavement.

Possible Causes:

1. Shrinkage due to temperature changes and/or hardening of the asphalt.
2. Frost action.
3. Subgrade settlement or movement (does not apply to Block Cracking).
4. Poor construction practices in the fabrication of pavement joints.
5. Reflective cracks caused by cracks beneath the surface.

Severity Levels:

Low - Single or multiple cracks less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single or multiple cracks from 1/4 to 1 inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

High - Single or multiple cracks greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of the 500 foot section affected using the following guidelines.

Random cracks spaced no greater than 10 ft. = 100% or 10
Random cracks spaced no greater than 20 ft. = 90% or 9
Random cracks spaced no greater than 30 ft. = 80% or 8
Random cracks spaced no greater than 40 ft. = 70% or 7
Random cracks spaced no greater than 50 ft. = 60% or 6
Random cracks spaced no greater than 60 ft. = 50% or 5
Random cracks spaced no greater than 70 ft. = 40% or 4
Random cracks spaced no greater than 80 ft. = 30% or 3
Random cracks spaced no greater than 90 ft. = 20% or 2
Random cracks spaced no greater than 100 ft. = 10% or 1

Measurement should be rated on the worst lane. If significant differences exist between lanes, it should be noted under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
CRACKING OTHER (%)	N	None	10	8				18	36	
	L	< 1/4"		2	7	5	2	16	32	
	M	1/4"-1"/Secondary			3	4	7	14	28	
	H	>1"/Spalled				1	1	2	4	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Low Severity Cracking (Other)

Medium Severity Cracking (Other)

High Severity Cracking (Other)

RAVELLING

Description: Ravelling is the progressive deterioration of the pavement surface caused by the dislodging of aggregate particles.

Possible Causes:
1. Poor quality mixture.
2. Traffic action on a weak surface.
3. Asphalt binder has hardened appreciably resulting in poor aggregate to asphalt adhesion.

Severity Levels: No degrees of severity are defined. Ravelling should only be noted when there is an extensive loss of coarse aggregate.

S - Severe - Extensive loss of coarse aggregate.

How to Measure: Estimate the percentage of the 500 foot section affected.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
RAVELLING (%)	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Severe Ravelling

WHEEL PATH RUTTING

Description: Longitudinal surface depressions in the wheel paths (approximately 3 foot wide per wheel path). Pavement uplift may occur along the sides of the rut. In many instances, ruts are not easily noticeable, therefore a measurement should always be taken.

Possible Causes: Wheel path rutting may be a load related failure of the pavement or merely result from pavement wear. Any one or combination of the following may result in wheel path rutting.

1. Insufficient pavement thickness
2. Unstable subgrade
3. Insufficient compaction during construction
4. Pavement wear or loss due to abrasive action of traffic

Severity Levels: Low - Average rut depth of 1/4 - 3/8 inch.

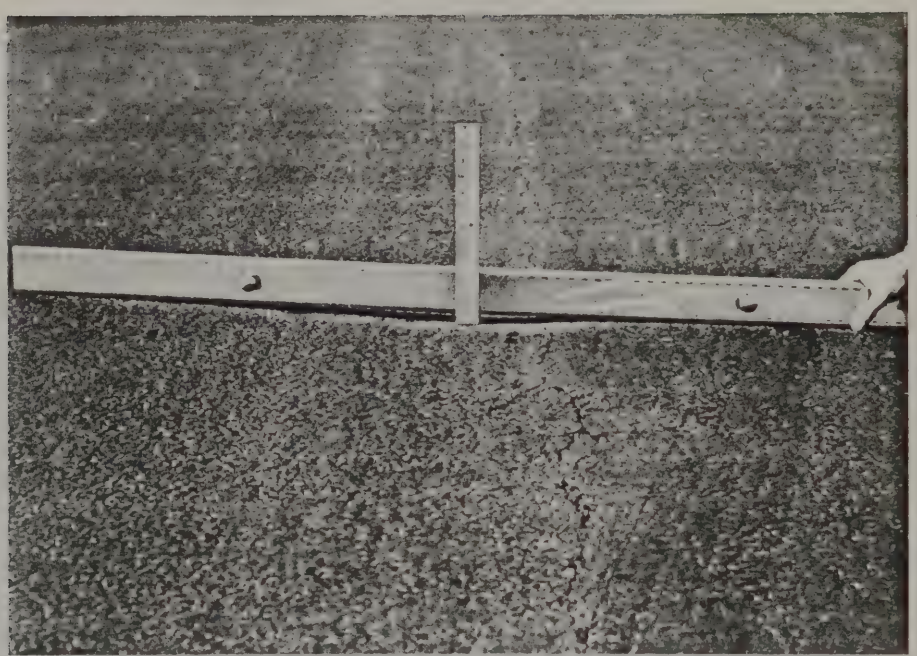
Medium - Average rut depth of 1/2 - 3/4 inch.

High - Average rut depth of greater than 3/4 inch.

How to Measure: Record rutting depth in lane exhibiting greatest rut depth. Record depth using an average of 5 measurements taken at 100 foot intervals throughout section. Put a checkmark in the box corresponding to the average rut depth. If significant differences exist between lanes note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH RUTTING (✓)	N	None	✓					1	20	
	L	1/4"-3/8"		✓	✓		✓	3	60	
	M	1/2"-3/4"				✓		1	20	
	H	>3/4"								

$$\% = \frac{\Sigma \text{ of Checkmarks}}{\text{Number of Sections Evaluated}} \times 100$$



Medium Severity Wheel Path Rutting

CORRUGATIONS

Description: Corrugations is a series of ripples occuring at fairly regularly spaced intervals perpendicular to the pavement centerline. It usually occurs at points where traffic accelerates and decelerates.

Possible Causes: 1. Traffic action combined with

a. pavement that has poor stability properties
b. excessive moisture in the subgrade
c. contaminated asphalt

Severity Levels: No degrees of severity are defined. Corrugation should be noted only when they result in an objectionable ride.

How to Measure: Estimate the percentage of the 500 foot section affected. If significant differences exist between lanes note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
CORRUGATIONS (%)	N	None	10	10	9	10	10	49	98	
	S	Object. Ride			1			1	2	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Severe Corrugations

SETTLEMENTS AND HEAVES

Description: Settlements are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. Heaves are localized upward displacements of the pavement surface.

Possible Causes:
1. Frost action (heaves)
2. Settlement of the subgrade

Severity Levels: No degrees of severity are defined. Settlements and heaves should be noted only when they result in an objectionable ride.

S - objectionale ride.

How to Measure: Record as the number of settlements and/or heaves counted in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
SETTLEMENT & HEAVES (#)	N	None	✓		✓	✓	✓			
	S	Object. Ride		2				2		

% = DO NOT CALCULATE

Severe Heave

ASPHALT CONCRETE OVERLAY OR SPRAY PATCH

Description: A lane or full pavement width of asphalt concrete or spray patch placed to improve rideability over localized distress areas.

Possible Cause: 1. A localized settlement and/or excessive surface distress.

Severity Levels: Low - Good condition, asphalt concrete overlay shows no signs of distress.

Medium - Underlying problem reflecting through, such as cracks showing, potholes, spot secondary patching, etc.

High - Poor condition, extensive cracking, potholes and/or ravelling. Patch replacement necessary.

How to Measure: Record as the number of patches counted in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
ASPHALT CONC. OVERLAY OR SPRAY PATCH (##)	N	None	✓	✓		✓	✓			
	L	Good			2			2		
	M	Fair								
	H	Poor								

% = DO NOT CALCULATE

Asphalt Concrete Overlay or Spray Patch Pictures

See Appendix II

Distress Data Collection Procedure - Rigid Pavement

BR-48(3/84)

NYSDOT DISTRESS DATA FORM FLEXIBLE PAVEMENT

Region _____ County _____ Route No. _____ Direction _____ PIN _____

Number of Lanes _____ Survey Pertinent to _____ Lane(s) _____

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH CRACKING (%)	N	None	6		1			7	14	
	L	< 1/4"	4	8	5	6	5	28	56	
	M	1/4"-1"/Secondary		2	4	4	5	15	30	
	H	>1"/Alligator								
EDGE CRACKING (%)	N	None	10	10	4	2	3	29	58	
	L	< 1/4"			4	8	6	18	36	
	M	1/4"-1"/Secondary			2		1	3	6	
	H	>1"/Spalled								
FULLWIDTH TRANSVERSE CRACKING (#)	N	None								
	L	< 1/4"	2	3		2		7		
	M	1/4"-1"/Secondary	4	3	5	4	6	22		
	H	>1"/Spalled		1	2	1	2	6		
LONGITUDINAL CRACKING (%)	N	None	10	10			2	22	44	
	L	< 1/4"			8	6	1	15	30	
	M	1/4"-1/Secondary			2	4	7	13	26	
	H	>1"/Spalled								
CRACKING OTHER (%)	N	None	10	8				18	36	
	L	< 1/4"		2	7	5	2	16	32	
	M	1/4"-1"/Secondary			3	4	7	14	28	
	H	>1"/Spalled				1	1	2	4	
RAVELLING (%)	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	
WHEELPATH RUTTING (✓)	N	None	✓					1	20	
	L	1/4"-3/8"		✓	✓		✓	3	60	
	M	1/2"-3/4"				✓		1	20	
	H	>3/4"								
CORRUGATIONS (%)	N	None	10	10	9	10	10	49	98	
	S	Object. Ride			1			1	2	
SETTLEMENT & HEAVES (#)	N	None	✓		✓	✓	✓			
	S	Object. Ride		2				2		
ASPHALT CONC. OVERLAY OR SPRAY PATCH (#)	N	None	✓	✓		✓	✓			
	L	Good			2			2		
	M	Fair								
	H	Poor								

SHOULDER SURVEY PERTINENT TO: BOTH ✓ RIGHT ___ LEFT ___ SHOULDERS

SHOULDER DETERIORATION (%)	N	None	10	3	3	10		26	52	
	L	Minor Cracking		7	5		6	18	36	
	M	Severe Crack ≤ 3'			2		4	6	12	
	H	Severe Crack								
LANE/SHOULDER SEPARATION (%)	N	None	10	2		2		14	28	
	L	< 1/4"/Sealed		8	6	8	5	27	54	
	M	1/4"-1"			4		5	9	18	
	H	>1"								
LANE/SHOULDER DROPOFF (%)	N	None	10	10	7	10	10	47	94	
	L	1/4"-3/4"								
	M	1"-2"			3			3	6	
	H	>2"								
SHOULDER (%) DEFORMATION	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	

Date Insp. ___/___/___ Inspectors _____ Sheet ___ of ___

APPENDIX IV

Distress Data Collection Procedures

Flexible/Rigid Pavement

WHEEL PATH CRACKING

Description: Visible fractures or separations only within the wheel paths (Approximately 3 foot wide per wheel path). The cracking begins as single or multiple longitudinal cracks which may have some secondary cracking. After repeated traffic loading the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are normally less than 1 foot on the longest side.

Possible Causes: Wheel path cracking is a load related failure of the pavement. Any one or combination of the following may result in wheel path cracking:

1. Unstable subgrade
2. Insufficient pavement thickness
3. Degradation and/or stripping

Severity Levels: Low - Single or multiple longitudinal cracks less than 1/4 of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single or multiple longitudinal cracks greater than or euqal to 1/4 of an inch wide, or cracks that have significant secondary cracking and/or minor ravelling. This includes cracks that have been ineffectively sealed.

High - Alligator cracking and/or cracks greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of the 500 foot section affected. One wheel path that is cracked for the entire length would represent 100 percent, or cracking over entire length jumping from one wheel path or lane to another would also represent 100 percent.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH CRACKING (%)	N	None	6		1			7	14	
	L	< 1/4"	4	8	5	6	5	28	56	
	M	1/4"-1"/Secondary		2	4	4	5	15	30	
	H	>1"/Alligator								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Wheel Path Cracking Pictures

See Appendix III

Distress Data Collection Procedure - Flexible Pavement

TRANSVERSE JOINT CRACKING

Description: Visible fractures or separations of the pavement surface perpendicular to the pavement centerline. These cracks are associated with the underlying transverse contraction and/or expansion joints. They will have uniform spacing, usually 20 feet, 60 feet or 100 feet depending on the PCC pavement joint spacing design.

Possible Causes: Movement of the underlying concrete slab in either horizontal or vertical direction overstresses the asphalt concrete overlay resulting in a reflection crack. Movements in the concrete slab are due to temperature fluctuations and loading.

Severity Levels: Low - Single crack less than ¼ of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single crack from ¼ to 1 inch wide, or cracks that have significant secondary cracking and/or ravelling. This includes cracks that have been ineffectively sealed.

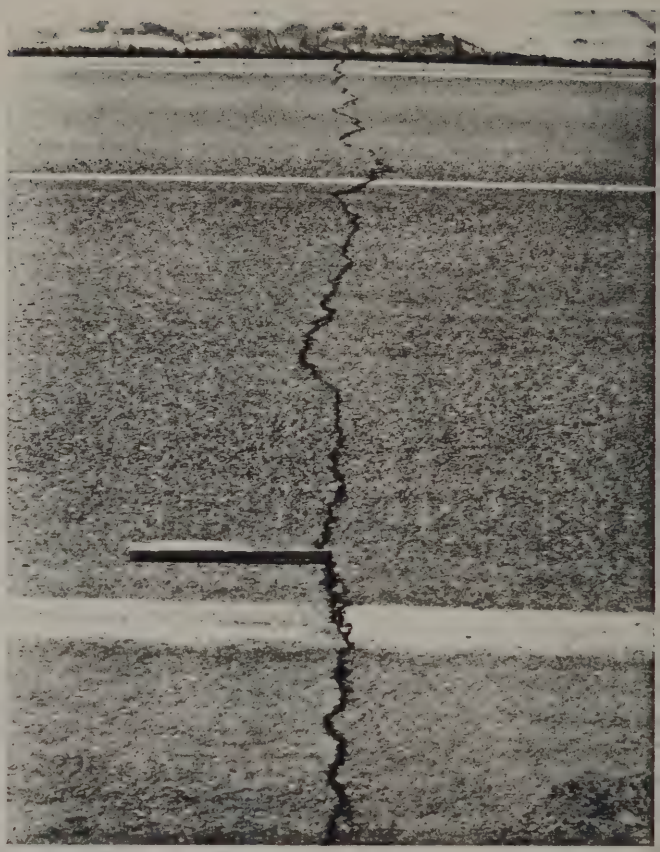
High - Single crack greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Record the number of cracks occurring at each severity level within the 500 foot section.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
TRANSVERSE JOINT CRACKING (#)	N	None	✓							
	L	< 1/4"		3	2			5		
	M	1/4"-1"/Secondary			4	4	6	14		
	H	> 1"/Spalled				2		2		

% = DO NOT CALCULATE

Low Severity Transverse Joint Cracking



Medium Severity Transverse Joint Cracking

High Severity Transverse Joint Cracking

TRANSVERSE JOINT FAULTING

Description: Differential vertical displacement of abutting slabs at the transverse PCC pavement joints creating a step deformation on the pavement surface.

Possible Causes: Loss of load transfer and subgrade material beneath the pavement slabs. Faulting progresses with time and vehicle passes as subgrade material is displaced from beneath the pavement.

Severity Levels: Low - Slab vertical displacement of at least 1/8 inch but no greater than 1/4 inch.

Medium - Slab vertical displacement of greater than 1/4 inch but no greater than 3/4 inch.

High - Slab vertical displacement greater than 3/4 inch.

How to Measure: Measure to nearest 1/8 inch at 5 transverse joints within the 500 foot test section for detail survey. The fault shall be measured 1 foot from the pavement edge. Checkmark category in which the majority of measurements fall.

ISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
TRANSVERSE JOINT FAULTING (✓)	N	None	✓	✓				2	40	
	L	1/8"-1/4"			✓	✓	✓	3	60	
	M	3/8"-3/4"								
	H	>3/4"								

$$\% = \frac{\Sigma \text{ of Checkmarks}}{\text{Number of Sections Evaluated}} \times 100$$

Transverse Joint Faulting Pictures

See Appendix II

Distress Data Collection Procedure - Rigid Pavement

LONGITUDINAL JOINT CRACKING

Description: Visible fractures or separations of the pavement surface running parallel to the pavement centerline. These cracks are associated with the underlying longitudinal joint in the PCC pavement slab.

Possible Causes: Differential movement in the underlying PCC concrete lanes. These movements are due primarily to traffic loading.

Severity Levels: Low - Single crack less than ¼ of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

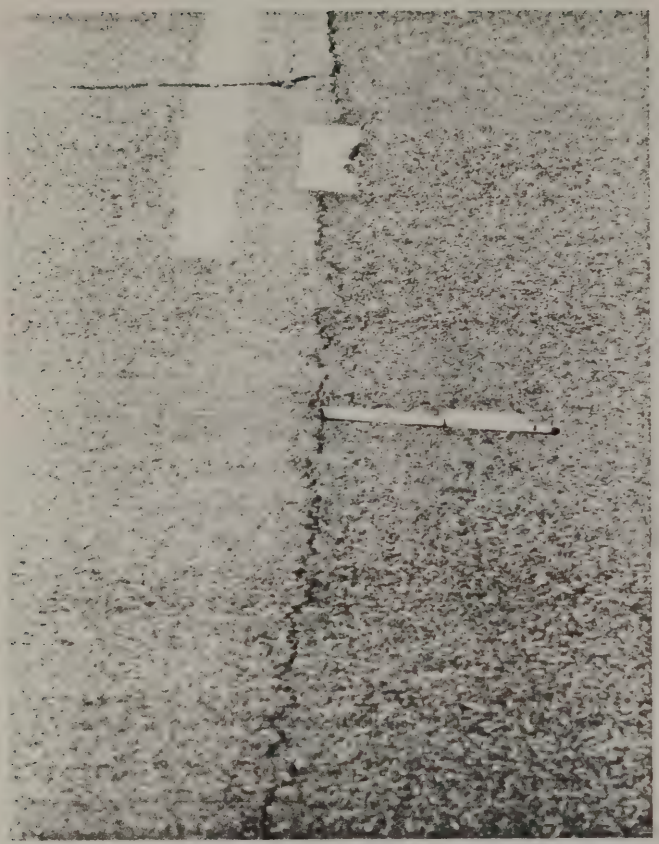
Medium - Single crack from ¼ to 1 inch wide, or cracks that have significant secondary cracking and/or ravelling. This includes cracks that have been ineffectively sealed.

High - Single crack greater than 1" wide which may have large spalls and/or pieces broken or missing.

How to Measure: Estimate the percentage of length of the 500 foot section affected.

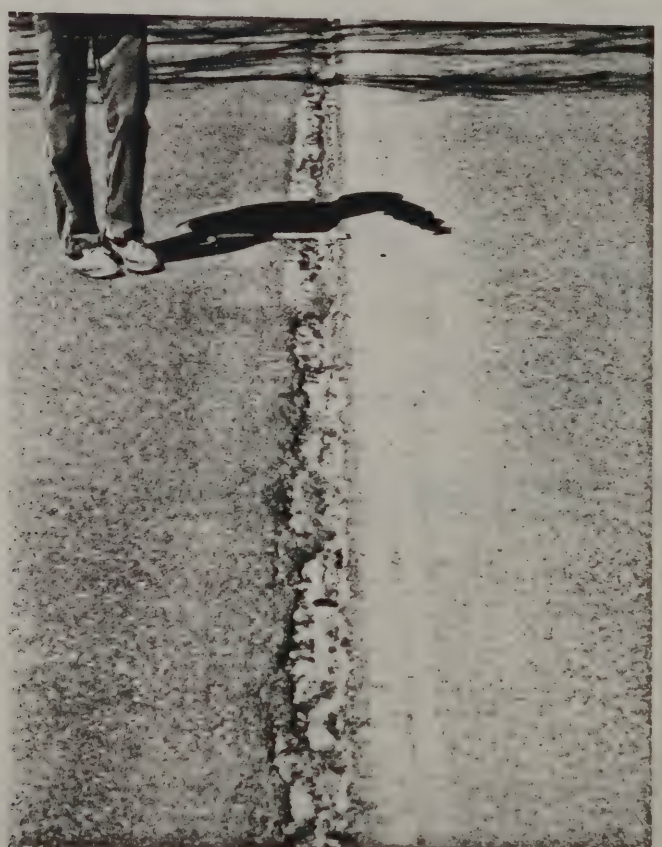
DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
LONGITUDINAL JOINT CRACKING (%)	N	None		4		1		5	10	
	L	< 1/4"	10	6	7	5	4	32	64	
	M	1/4"-1"/Secondary			3	4	6	13	26	
	H	>1"/Spalled								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$



Low Severity Longitudinal Joint Cracking

Medium Severity Longitudinal Joint Crackin



High Severity Longitudinal Joint Cracking

REFLECTIVE CRACKING (OTHER)

Description: Visible fractures or separations of the pavement surface not categorized by any of the other distress categories. Includes cracks located in the pavement slabs at their mid span or third points, that have reflected through the overlay.

Possible Causes: Horizontal and vertical movement in the underlying concrete pavement primarily due to traffic loading. These movements transmit stresses into the asphalt concrete overlay which result in reflection cracking.

Severity Levels: Low - Single crack less than ¼ of an inch wide that may have some minor secondary cracking. This includes cracks that are effectively sealed.

Medium - Single crack from ¼ to 1 inch wide, or cracks that have significant secondary cracking and/or ravelling. This includes cracks that have been ineffectively sealed.

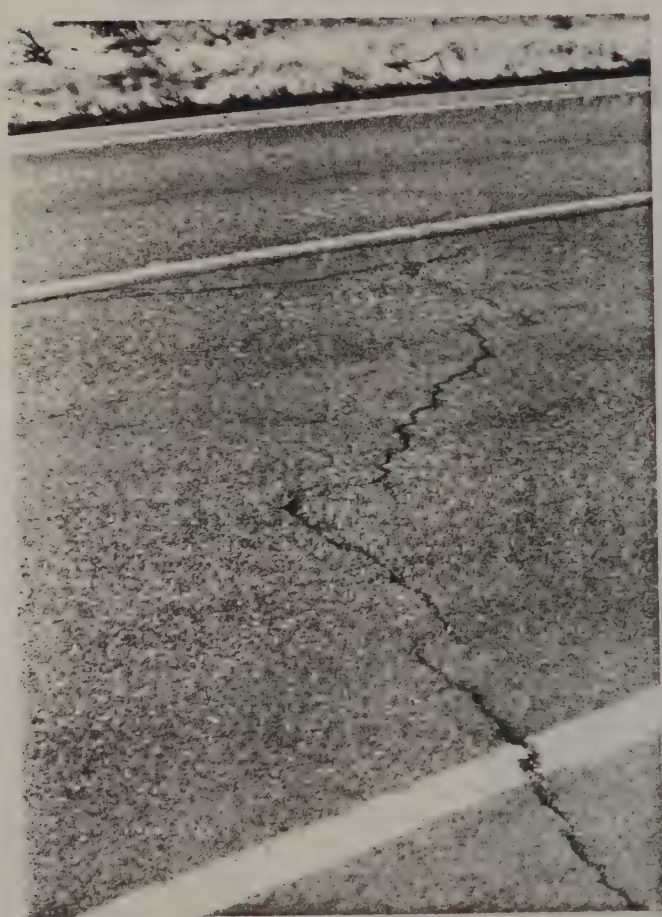
High - Single crack greater than 1 inch wide which may have large spalls and/or pieces broken or missing.

How to Measure: Record the number of cracks occurring at each severity level within the 500 foot section.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
REFLECTIVE CRACKING (OTHER) (#)	N	None	✓	✓						
	L	< 1/4"			4	2		6		
	M	1/4"-1"/Secondary				1	3	4		
	H	> 1"/Alligator								

% = DO NOT CALCULATE

Low Severity Reflective Cracking (Other)



Medium Severity

High Severity

SLIPPAGE CRACKS

Description: Slippage cracks are crescent or half-moon shaped cracks produced by vehicles breaking or turning their wheels causing the pavement surface to slide or deform.

Possible Causes:

1. Poor bond between the surface and lower layer of the pavement.
2. Low stability mix can also contribute to debonding of pavement layers causing slippage cracks.

Severity Levels: No degrees of severity are defined. Slippage cracks shall be noted whenever they are present.

How to Measure: When slippage cracks are present note them with a checkmark.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
SLIPPAGE CRACKS (✓)	N	None	✓	✓		✓	✓	4	80	
	P	Present			✓			1	20	

$$\% = \frac{\Sigma \text{ of Checkmarks}}{\text{Number of Sections Evaluated}} \times 100$$

Slippage Cracks

RAVELLING

Description: Ravelling is the progressive deterioration of the pavement surface caused by the dislodging of aggregate particles.

Possible Causes:
1. Poor quality mixture.
2. Traffic action on a weak surface.
3. Asphalt binder has hardened appreciably resulting in poor aggregate to asphalt adhesion.

Severity Levels: No degrees of severity are defined. Ravelling should only be noted when there is an extensive loss of coarse aggregate.

S - Severe - Extensive loss of coarse aggregate.

How to Measure: Estimate the percentage of the 500 foot section affected.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
RAVELLING (%)	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Ravelling Picture

See Appendix III

Distress Data Collection Procedure - Flexible Pavement

Wheel Path Rutting Pictures

See Appendix III

Distress Data Collection Procedure - Flexible Pavement

WHEEL PATH RUTTING

Description: Longitudinal surface depressions in the wheel paths (approximately 3 foot wide per wheel path). Pavement uplift may occur along the sides of the rut. In many instances, ruts are not easily noticeable, therefore a measurement should always be taken.

Possible Causes: Wheel path rutting may be a load related failure of the pavement or merely result from pavement wear. Any one or combination of the following may result in wheel path rutting.

1. Insufficient pavement thickness
2. Unstable subgrade
3. Insufficient compaction during construction
4. Pavement wear or loss due to abrasive action of traffic

Severity Levels: Low - Average rut depth of 1/4 - 3/8 inch.

Medium - Average rut depth of 1/2 - 3/4 inch.

High - Average rut depth of greater than 3/4 inch.

How to Measure: Record rutting depth in lane exhibiting greatest rut depth. Record depth using an average of 5 measurements taken at 100 foot intervals throughout section. Put a checkmark in the box corresponding to the average rut depth. If significant differences exist between lanes note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH RUTTING (✓)	N	None	✓					1	20	
	L	1/4"-3/8"		✓	✓		✓	3	60	
	M	1/2"-3/4"				✓		1	20	
	H	>3/4"								

$$\% = \frac{\Sigma \text{ of Checkmarks}}{\text{Number of Sections Evaluated}} \times 100$$

CORRUGATIONS

Description: Corrugations is a series of ripples occuring at fairly regularly spaced intervals perpendicular to the pavement centerline. It usually occurs at points where traffic accelerates and decelerates.

Possible Causes: 1. Traffic action combined with

a. pavement that has poor stability properties
b. excessive moisture in the subgrade
c. contaminated asphalt

Severity Levels: No degrees of severity are defined. Corrugation should be noted only when they result in an objectionable ride.

How to Measure: Estimate the percentage of the 500 foot section affected. If significant differences exist between lanes note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
CORRUGATIONS (%)	N	None	10	10	9	10	10	49	98	
	S	Object. Ride			1			1	2	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Corrugations Picture

See Appendix III

Distress Data Collection Procedure - Flexible Pavement

SETTLEMENTS AND HEAVES

Description: Settlements are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. Heaves are localized upward displacements of the pavement surface.

Possible Causes:
1. Frost action (heaves)
2. Settlement of the subgrade

Severity Levels: No degrees of severity are defined. Settlements and heaves should be noted only when they result in an objectionable ride.

S - objectionale ride.

How to Measure: Record as the number of settlements and/or heaves counted in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL £	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
SETTLEMENTS & HEAVES (##)	N	None	✓		✓	✓	✓			
	S	Object. Ride		2				2		

% = DO NOT CALCULATE

Settlements & Heaves Picture

See Appendix III

Distress Data Collection Procedure - Flexible Pavement

WIDENING DROPOFF

Description: A widening dropoff is a difference in elevation across the longitudinal joint between the original pavement and the widening.

Possible Causes:
1. Consolidation of the widening due to traffic loadings.
2. Movement of the subgrade underneath the widening.

Severity Levels:

Low - Dropoff is between 1/4 - 1/2 of an inch.

Medium - Dropoff is between 5/8 - 1 inch.

High - Dropoff is greater than 1 inch.

How to Measure: Estimate the percentage of the 500 foot section affected.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	£	%	
WIDENING DROPOFF (%)	N	None	10	10	3	10	10	43	86	
	L	1/4"- 1/2"			7			7	14	
	M	5/8"-1"								
	H	>1"								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

High Severity Widening Dropoff

ASPHALT CONCRETE OVERLAY OR SPRAY PATCH

Description: A lane or full pavement width of asphalt concrete or spray patch placed to improve rideability over localized distress areas.

Possible Cause: 1. A localized settlement and/or excessive surface distress.

Severity Levels: Low - Good condition, asphalt concrete overlay shows no signs of distress.

Medium - Underlying problem reflecting through, such as cracks showing, potholes, spot secondary patching, etc.

High - Poor condition, extensive cracking, potholes and/or ravelling. Patch replacement necessary.

How to Measure: Record as the number of patches counted in each half mile survey length.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	#	%	
ASPHALT CONC. OVERLAY OR SPRAY PATCH (##)	N	None	✓	✓		✓	✓			
	L	Good			2			2		
	M	Fair								
	H	Poor								

% = DO NOT CALCULATE

Asphalt Concrete Overlay or Spray Patch Pictures

See Appendix II

Distress Data Collection Procedure - Rigid Pavement

(3/84)

NYSDOT DISTRESS DATA FORM FLEXIBLE/RIGID PAVEMENT

Region _____ County _____ Route No. _____ Direction _____ PIN _____

Number of Lanes _____ Survey Pertinent to _____ Lane(s) _____

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	%	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
WHEELPATH CRACKING (%)	N	None	6		1			7	14	
	L	< 1/4"	4	8	5	6	5	28	56	
	M	1/4"-1"/Secondary		2	4	4	5	15	30	
	H	>1"/Alligator								
TRANSVERSE JOINT CRACKING (#)	N	None	✓							
	L	< 1/4"		3	2			5		
	M	1/4"-1"/Secondary			4	4	6	14		
	H	>1"/Spalled				2		2		
TRANSVERSE JOINT FAULTING (✓)	N	None	✓	✓				2	40	
	L	1/8"-1/4"			✓	✓	✓	3	60	
	M	3/8"-3/4"								
	H	>3/4"								
LONGITUDINAL JOINT CRACKING (%)	N	None		4		1		5	10	
	L	< 1/4"	10	6	7	5	4	32	64	
	M	1/4"-1"/Secondary			3	4	6	13	26	
	H	>1"/Spalled								
REFLECTIVE CRACKING (OTHER) (#)	N	None	✓	✓						
	L	< 1/4"			4	2		6		
	M	1/4"-1"/Secondary				1	3	4		
	H	>1"/Alligator								
SLIPPAGE CRACKS (✓)	N	None	✓	✓		✓	✓	4	80	
	P	Present			✓			1	20	
RAVELLING (%)	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	
WHEELPATH RUTTING (✓)	N	None	✓					1	20	
	L	1/4"-3/8"		✓	✓		✓	3	60	
	M	1/2"-3/4"				✓		1	20	
	H	>3/4"								
CORRUGATIONS (%)	N	None	10	10	9	10	10	49	98	
	S	Object. Ride			1			1	2	
SETTLEMENTS & HEAVES (#)	N	None	✓		✓	✓	✓			
	S	Object. Ride		2				2		
WIDENING DROPOFF (%)	N	None	10	10	3	10	10	43	86	
	L	1/4"- 1/2"			7			7	14	
	M	5/8"-1"								
	H	>1"								
ASPHALT CONC. OVERLAY OR SPRAY PATCH (#)	N	None	✓	✓		✓	✓			
	L	Good			2			2		
	M	Fair								
	H	Poor								

SHOULDER SURVEY PERTINENT TO: BOTH ✓ RIGHT ___ LEFT ___ SHOULDERS

SHOULDER DETERIORATION (%)	N	None	10	3	3	10		26	52	
	L	Minor Cracking		7	5		6	18	36	
	M	Severe Crack ≤ 3"			2		4	6	12	
	H	Severe Crack								
LANE/SHOULDER SEPARATION (%)	N	None	10	2		2		14	28	
	L	<1/4"/Sealed		8	6	8	5	27	54	
	M	1/4"-1"			4		5	9	18	
	H	>1"								
LANE/SHOULDER DROPOFF (%)	N	None	10	10	7	10	10	47	94	
	L	1/4"-3/4"								
	M	1"-2"			3			3	6	
	H	>2"								
SHOULDER (%) DEFORMATION	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	

Date Insp. ___/___/___ Inspectors _____ Sheet ___ of ___

APPENDIX V

Distress Data Collection Procedures

Shoulders

SHOULDER DETERIORATION

Description: Deterioration is characterized by surface and/or structural distress in paved shoulders only; causing cracking and/or potholes.

Possible Causes: Deterioration of shoulders is generally caused by the same factors that deteriorate pavements. Refer to Wheel Path Cracking, Edge Cracking, Cracking (Other), and Ravelling.

Severity Levels: Low - Minor cracking over entire shoulder (includes secondary cracking).

Medium - Potholes, severe alligator cracking within 3 feet of the edge of the shoulder.

High - Potholes, severe alligator cracking over entire shoulder.

How to Measure: Estimate the percentage of the 500 foot section affected. Generally rate the right hand shoulder, if significant differences exist in left hand shoulder note under remarks.

DISTRESS	SEVERITY		SECTION	(1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
			Beg	1000	1005	1010	1015	1020			
			End	1005	1010	1015	1020	1025	Σ	%	
SHOULDER DETERIORATION (%)	N	None		10	3	3	10		26	52	
	L	Minor Cracking			7	5		6	18	36	
	M	Severe Crack ≤ 3'				2		4	6	12	
	H	Severe Crack									

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Low Severity Shoulder Deterioration

Medium Severity Shoulder Deterioration

High Severity Shoulder Deterioration

LANE/SHOULDER SEPARATION

Description: Lane/Shoulder separation is a widening of the joint between the traffic lane and the shoulder which allows infiltration of water into the pavement and shoulder subgrade.

Possible Causes:
1. Outward movement of the shoulder
2. Movement of the curb

Severity Levels: Severity level is determined by the width of the joint opening, or the opening between the pavement and curb.

Low - Joint separation is less than 1/4 of an inch or is effectively sealed.

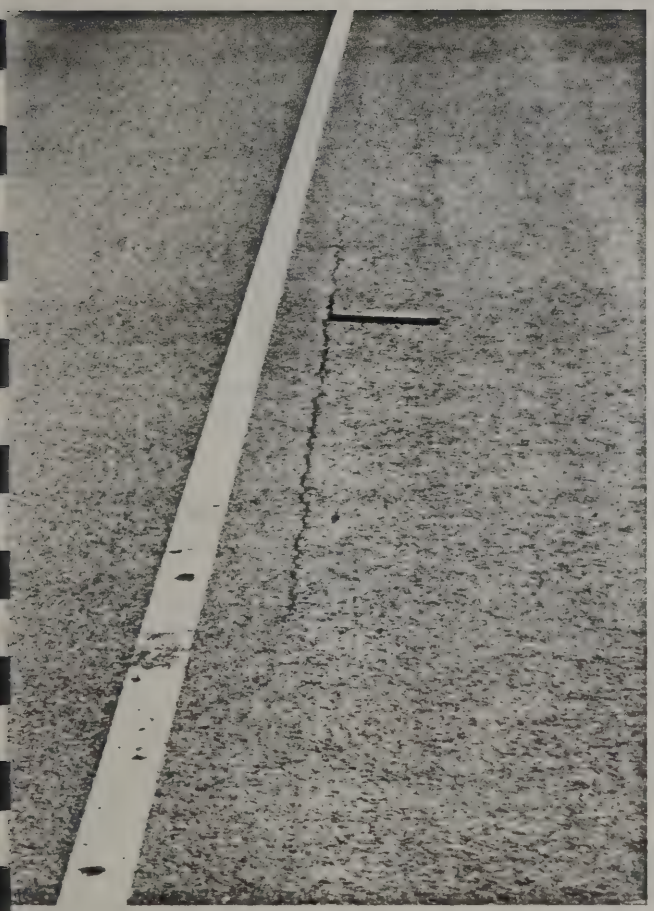
Medium - Joint separation is between 1/4 - 1 inch.

High - Joint separation is greater than 1 inch.

How to Measure: Estimate the percentage of the 500 foot section affected. Generally rate the righthand shoulder, if a significant difference exists in lefthand shoulder note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025	Σ	%	
LANE/SHOULDER SEPARATION (%)	N	None	10	2		2		14	28	
	L	< 1/4"/Sealed		8	6	8	5	27	54	
	M	1/4"-1"			4		5	9	18	
	H	>1"								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$



Low Severity Lane/Shoulder Separation

High Severity Lane/Shoulder Separation

LANE/SHOULDER DROPOFF

Description: Lane/Shoulder dropoff is a difference in elevation between the pavement edge and the shoulder.

Possible Causes:
1. Loss of underlying fines due to water pumping action
2. Consolidation or settlement of the subgrade material
3. Loss of surface material on unpaved shoulders

Severity Levels:

Low - The difference in elevation between the pavement edge and the shoulder is 1/4 - 3/4 of an inch.

Medium - The difference in elevation is 1 - 2 inches.

High - The difference in elevation is greater than 2 inches.

How to Measure: Estimate the percentage of the 500 foot section affected. Generally rate the righthand shoulder, if a difference exists in the lefthand shoulder note under remarks.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL Σ	EXTENT TOTAL %	REMARKS
		Beg	1000	1005	1010	1015	1020			
		End	1005	1010	1015	1020	1025			
LANE/SHOULDER DROPOFF (%)	N	None	10	10	7	10	10	47	94	
	L	1/4"-3/4"								
	M	1"-2"			3			3	6	
	H	>2"								

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

Medium Severity Lane/Shoulder Dropoff

Severe Shoulder Deformation

SHOULDER DEFORMATION

Description: Deformations are distortions in the shoulder cross section. This includes washouts, ruts, settlements, and heaves.

Possible Causes:
1. Unstable subgrade
2. Insufficient pavement thickness
3. Poor construction materials
4. Water intrusion

Severity Levels: No degrees of severity are defined. Deformations should be noted when it is extensive enough to warrant major shoulder restoration or complete shoulder rehabiliation.

How to Measure: Estimate the percentage of the 500 foot section affected.

DISTRESS	SEVERITY		SECTION (1)	(2)	(3)	(4)	(5)	EXTENT TOTAL		REMARKS
			Beg 1000 / End 1005	1005 / 1010	1010 / 1015	1015 / 1020	1020 / 1025	£	%	
SHOULDER (%) DEFORMATION	N	None	10	10	8	10	10	48	96	
	S	Severe			2			2	4	

$$\% = \frac{\Sigma \text{ of Section Percentages}}{\text{Number of Sections Evaluated}} \times 10$$

SHOULDER SURVEY PERTINENT TO: BOTH ✓ RIGHT ___ LEFT ___ SHOULDERS

SHOULDER DETERIORATION (%)	N	None	10	3	3	10		26	52
	L	Minor Cracking		7	5		6	18	36
	M	Severe Crack ≤ 3'			2		4	6	12
	H	Severe Crack							

LANE/SHOULDER SEPARATION (%)	N	None	10	2		2		14	28
	L	< 1/4"/Sealed		8	6	8	5	27	54
	M	1/4"-1"			4		5	9	18
	H	>1"							

LANE/SHOULDER DROPOFF (%)	N	None	10	10	7	10	10	47	94
	L	1/4"-3/4"							
	M	1"-2"			3			3	6
	H	>2"							

SHOULDER (%) DEFORMATION	N	None	10	10	8	10	10	48	96
	S	Severe			2			2	4

Date Insp. 4/11/84 Inspectors J. Bushey Sheet 1 of 1

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